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GREATER LONDON HIGHWAY DEVELOPMENT SURVEY

Discussion opened by SIR CHARLES BRESSEY

Afternoon Meeting of the Society, 13 March 1939

AS soon as men learnt to build boats they discovered that the cheapest and most reliable propelling power for transport was the see-saw flow in a tidal estuary, one of the only agencies which gives travellers a return ticket gratis. Sea-going traders on their voyages of exploration naturally took advantage of the tide to carry them as far inland as they could safely penetrate, in order to tap the native markets to the fullest extent. Commerce was facilitated if the trading post was established at the lowest point at which the river was fordable so that trade could be readily carried on with the tribes on both banks. These are the considerations which dictated the position of London. The ford lowest down-stream was near Horseferry Road, Westminster, and if you prolong the line of Edgware Road (the Roman Watling Street) south-eastwards from the Marble Arch you will find that this all-important route was so laid out as to strike the Thames at the crossing subsequently known as the Horseferry—whence the present name of the road. This crossing lost much of its importance when the first London Bridge was built, and it was round this bridge-head that our metropolis began to cluster. As you all know, the Thames remained during more than fifteen centuries the principal highway of London for all purposes. In Stuart days, when an irate sovereign threatened to remove his Court from London, an alderman retorted bluffly that provided the Court did not take the Thames with them, London would still be able to make shift. In Queen Anne's reign Sir Roger de Coverley makes his excursions by water, giving preference on patriotic grounds to Thames watermen with wooden legs. The watermen were a numerous, obstinate, and influential fraternity that never failed to oppose any improvement of roads and vehicles.

The Port of London

This preamble is merely intended to emphasize what the modern motorist is sometimes apt to overlook, namely that London is first and foremost a port, the greatest in the world, and that it owes its shape, pattern, and

prosperity to the river Thames. Many capitals have their origin in a fortified hill-top, an acropolis, *e.g.* Athens and Edinburgh; others in a perennial water supply on droughty caravan routes, *e.g.* Damascus. But London has risen from the muddy wharves of the tidal Thames and the handy little creek of Walbrook below the Mansion House. From time immemorial the banks of the river have been so valuable for the prosaic purposes of trade and industry that London has tended to fall behind cities like Paris and Budapest in the matter of river-side amenities. Possessing the inestimable boon of a tidal river, which cost nothing for repaving, cleansing, or repair, the citizens of London could hardly be expected to display a great enthusiasm for the expensive craft of road-building. Owing to the neglect of this branch of engineering, the congestion in the City has reached such a pitch that a motorist can rely upon spending less time in making a circuit of 23 miles along the North Circular Road than in tediously threading his way along the diameter of the circle through the heart of the City, a distance of about 12 miles. Before long, owing to lack of street space, the Lord Mayors may find it necessary once again to hold their annual pageant on the river Thames, as their predecessors did for so many centuries.

Highway survey

The need for the Greater London Highway Development Survey, about which I am to speak this afternoon, was thus largely occasioned by the small esteem in which roads were held, generation after generation, by our river-faring forefathers, who would however have needed a superhuman degree of imagination to foresee the metropolis of the twentieth century. Greater London, as we know it to-day, is coterminous with the London Traffic Area, 1821 square miles in extent, comprised within a circle of about 25 miles radius from Charing Cross. Near the circumference of the circle you will find Ware in the north, Horley in the south, Maidenhead in the west, and East Tilbury in the east. This is the area covered by the recently published Highway Development Survey, in preparing which I had the advantage of Sir Edwin Lutyens' advice as consultant. The population of the area is about $9\frac{1}{2}$ millions, equivalent to the population of Norway and Sweden combined. Thus about one-fifth of the total population of Great Britain now resides in the London Traffic Area. In Queen Elizabeth's day the whole of England contained a population only half as numerous as that now resident in Greater London, but the metropolis still continues to sprawl, and in twelve years' time its population may be $10\frac{3}{4}$ millions. The rateable value of this territory is in excess of £100,000,000—somewhat less than two-fifths of the total rateable value of England and Wales. As one instance of the problems created by this teeming multitude of $9\frac{1}{2}$ millions, it may be observed that a very modest estimate of playing-field requirements is 4 acres per 1000 persons, on which basis a population of $9\frac{1}{2}$ millions would need approximately 60 square miles of playing fields—in other words, a strip of land a mile wide extending from King's Cross to Huntingdon. Here let me add in parenthesis that, greatly to the credit of the London County Council, an area of nearly 110 square miles has been saved from building during the past three years under the "Green Belt" scheme—a splendid achievement, though obviously this land will only

answer in small part to the description of "playing fields," which must lie within easy reach of the worker's home.

As regards the victualling of the metropolis: if, as has been stated, $2\frac{1}{4}$ acres of land are required, on the basis of current farming, to produce the food and other agricultural materials consumed by one unit of population, then the $9\frac{1}{2}$ million citizens of Greater London would need for their support an agricultural estate of 33,400 square miles, *i.e.* slightly more than the entire extent of Ireland (North and South).

London's growth

The spread of London may be illustrated by the following figures: In the year 1800 the built-up area could be contained within a circle of about 2 miles radius; in 1850 the radius had increased to about 4 miles, whereas to-day a circle of 10 miles radius cuts through typical suburban areas such as Enfield, Barking, Surbiton, and Harrow; the London Traffic Area is comprised within the circle of 25 miles radius to which the Highway Development Report relates. Should other illustrations of London's growth be desired, look at a map of 1750, and you will find open country at Whitechapel, a mile from the Mansion House; glance westwards towards Oxford Street, and you will see that Tottenham Court Road runs through open fields. Now turn to the present century. In north-west London the residential fringe was marked in 1905 by Hampstead, whereas in 1935 buildings had extended for 6 miles, absorbing Hendon and Edgware. In east London building development during the same thirty years has extended uninterruptedly for 6 miles through Ilford and Romford to Gidea Park. Again, in south-west London the built-up area has crept out from Streatham in 1905 to Cheam in 1935, a distance once more of 6 miles.

The river-side

Greater London, as a whole, being a somewhat unwieldy subject for a brief address, it will be appropriate if on this occasion, before an audience of geographers, I devote my remarks mainly to those recommendations made in the Report which directly or indirectly affect the river Thames and the river-side, for London, like Moses, was cradled among the bulrushes.

At the outset however reference should be made to some notable road improvements which have been effected in this area since 1919 under the Greater London Arterial Road Programme. Among the most important of these on the Essex bank must be ranked the remodelling of the London–Tilbury road, comprising the East Ham and Barking By-Pass, the Rainham By-Pass, the Purfleet By-Pass. In the same neighbourhood the Stanford-le-Hope By-Pass should be mentioned. The new London–Southend road runs for the greater part of its length a little farther inland, but it plays a highly important part in facilitating access between London and the lower Thames-side. In the seven years between 1928 and 1935 the traffic on this road doubled in volume. Seeing how rapid has been the industrial development of the lower Thames-side, one shudders to think what dire confusion would have prevailed to-day if these great schemes had not been undertaken, and if modern transport had still to rely on the narrow, winding country lanes which formerly constituted the road system. Glance for instance at the new town of

Dagenham, with a population approaching one hundred thousand, the Ford Works, the huge industrial concerns associated with oil, petrol, margarine, cement, etc.

Silvertown Way in West Ham (opened in 1934) deserves special mention as a notable East End improvement facilitating access to a supremely important group of docks and eliminating some extremely vexatious level-crossings. It affords a very instructive example of the advantages of a high-level road carried on a viaduct above the busy surface-streets teeming with local traffic. Incidentally it is to the credit of this viaduct that from it travellers gain a fascinating view, never before vouchsafed to them, of docks and shipping which are invisible from the streets at ground-level. Viaducts are so often and so thoughtlessly denounced as destructive of beauty that we do well to remember the refreshing and hitherto unsuspected views they may reveal.

Kent

Turning to the Kentish bank of the Thames, the London–Rochester road has been almost entirely remodelled, an interesting feature being the regrading and reopening of a length of the Roman Watling Street near Swanscombe which had fallen into complete disuse for fifteen hundred years, owing to its impracticable steepness. The Shooter's Hill By-Pass now spares drivers the toilsome journey over the crest of the hill; the Dartford By-Pass relieves the congestion of Dartford High Street, and the new Dartford–Erith road gives improved access to the river-side.

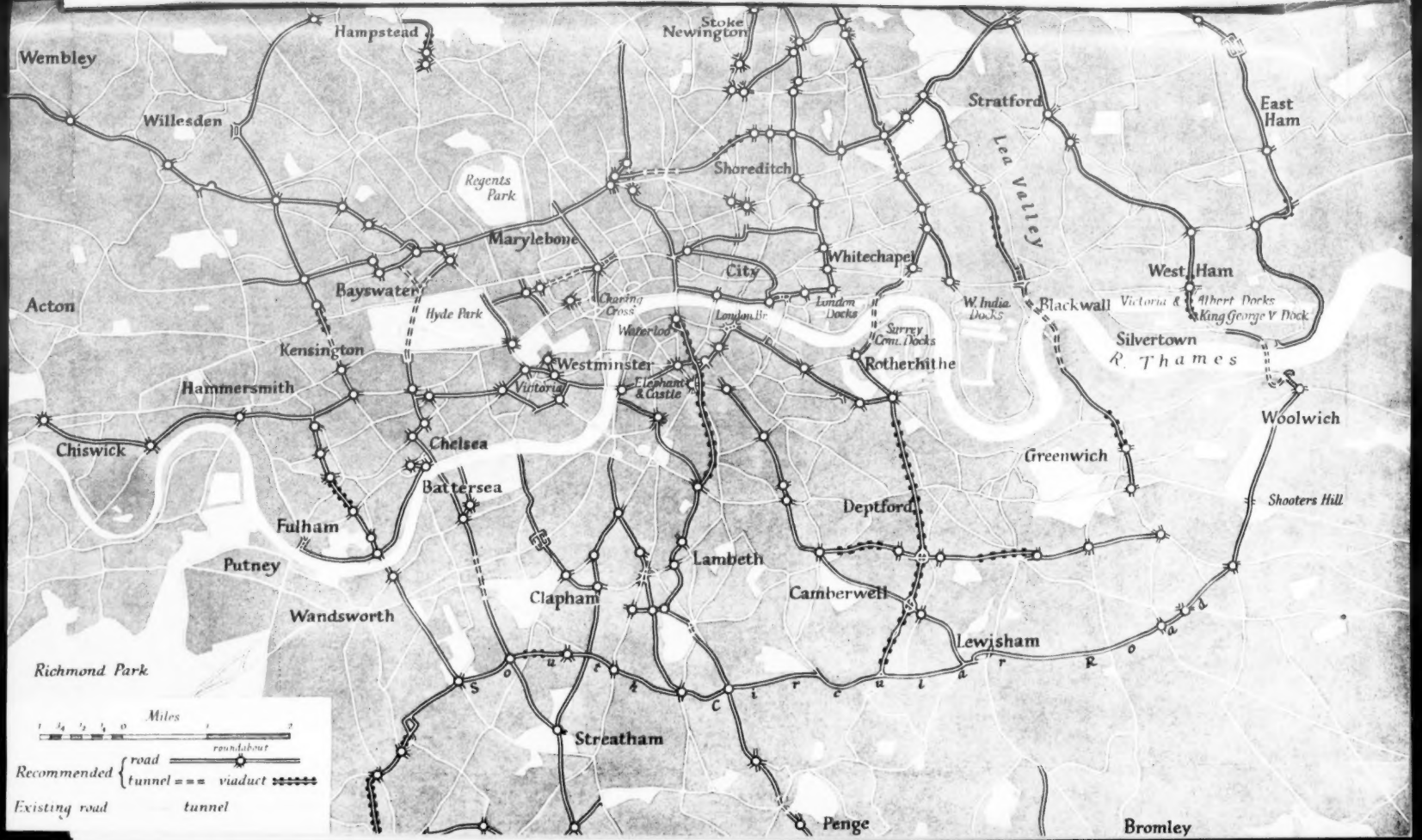
Lower Thames Tunnel

Good progress is being made to-day with the construction of a road tunnel under the Thames between Purfleet in Essex and Dartford in Kent. The pilot tunnel is already completed. It is interesting to recall that originally the site selected for the tunnel was 5 miles farther down-stream at Gravesend–Tilbury. Owing however to the great depth of the channel here, it was found desirable to choose the Dartford–Purfleet site, where the channel is shallower and the difficulties of tunnelling operations (under compressed air) correspondingly reduced. The opening of the new tunnel to road traffic will bring about an improvement which for importance can only be compared with the building of the original London Bridge. The character and prospects of adjoining territory in Kent and Essex will be transformed.

Orbital roads

Linking, as the Lower Thames Tunnel will do, the North Orbital and South Orbital Roads, it will serve as a most potent means of deflecting traffic from Inner London to this great outer boulevard, 125 miles long, destined, one may surely hope, to be constructed and maintained as a parkway worthy of the world's greatest capital. In Buckinghamshire and Hertfordshire sections of the route have already been built, in Surrey the line is being safeguarded. Elsewhere similar action may be expected. Now or never the opportunity presents itself for associating this Orbital Route with the Green Belt for which so much credit is due to the London County Council. To picture the Orbital Route, imagine a circle skirting St. Albans in the north, Reigate in the south, Egham in the west, and Purfleet in the east. The new bridge

Hampstead
Stoke
Newington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Lea Valley
Regents Park
Shoreditch
Marylebone
Whitechapel
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West Ham
Bayswater
Acton
Hyde Park
Charing Cross
Waterloo
London Br.
London Docks
W. India Docks
Blackwall
Victoria & Albert Docks
King George V Dock
Surrey Com. Docks
Silvertown
R. Thames
Kensington
Westminster
Rotherhithe
Hammersmith
Victoria
Elephant & Castle
Woolwich
Chiswick
Chelsea
Greenwich
Battersea
Deptford
Shooters Hill
Fulham
Lambeth
Putney
Clapham
Camberwell
Wandsworth
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Miles
roundabout
Recommended road
tunnel
viaduct
Existing road
tunnel
Streatham
Penge
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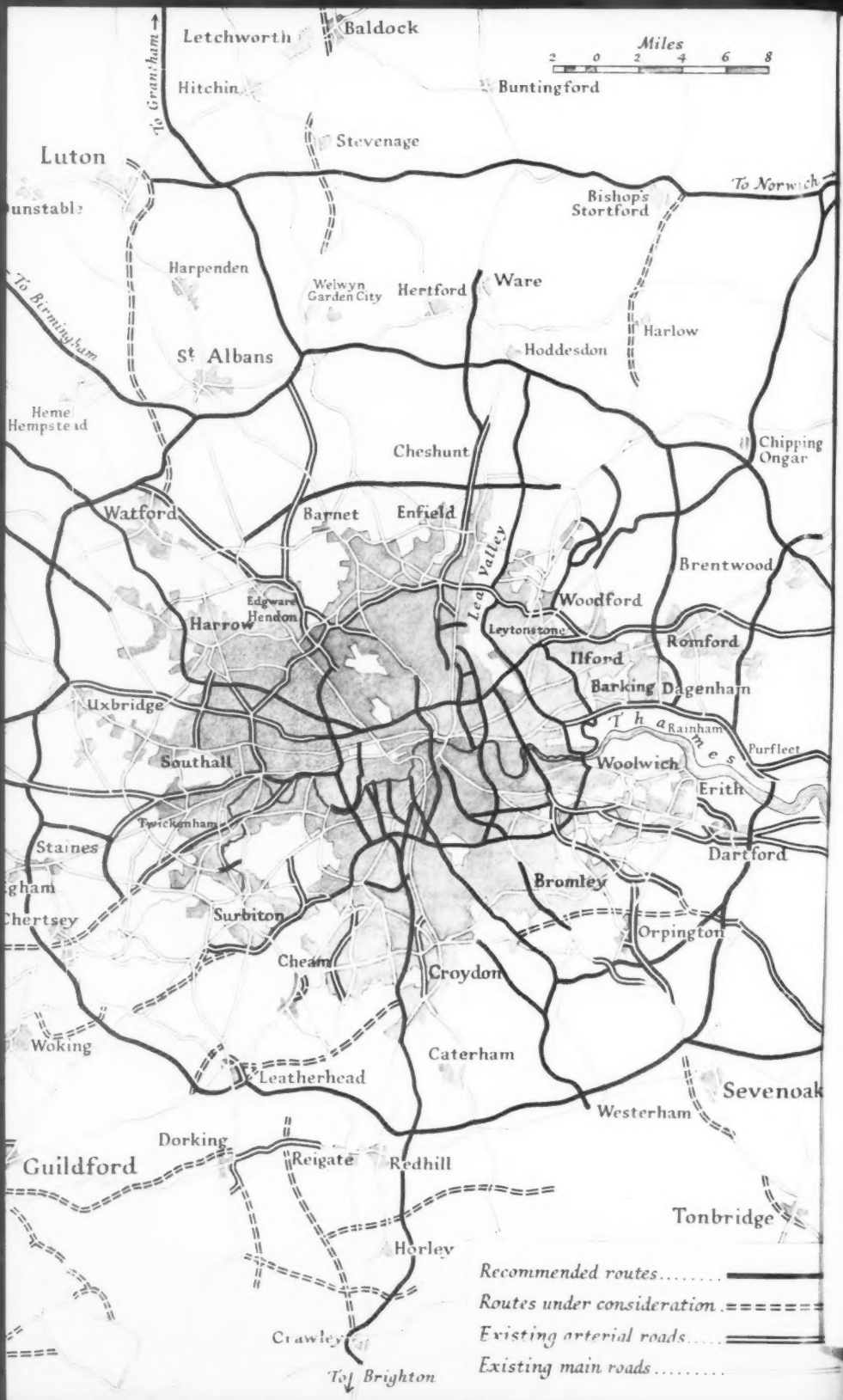
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Stevenage
Luton
To Norwich
Bishop's Stortford
Harpenden
Welwyn Garden City
Hertford
Ware
To Birmingham
St Albans
Harlow
Hoddesdon
Hemel Hempstead
Cheshunt
Chipping Ongar
Watford
Barnet
Enfield
Lea Valley
Brentwood
Edgware
Hendon
Harrow
Woodford
Leytonstone
Romford
Ilford
Barking
Dagenham
Uxbridge
Rainham
Thames
Purfleet
Southall
Woolwich
Erith
Twickenham
Staines
Dartford
Bromley
Surbiton
Orpington
Chertsey
Cheam
Croydon
Woking
Caterham
Leatherhead
Sevenoaks
Westerham
Dorking
Guildford
Reigate
Redhill
Tonbridge
Horley
Crawley
To Brighton
Recommended routes
Routes under consideration
Existing arterial roads
Existing main roads

which will carry this great highway over the Thames at Egham will relieve the strain inflicted on Staines High Street and Staines Bridge during week-ends and holidays.

Bridges

Before closing the record of improvements effected along the Thames-side during the present century, a word should be said of the rebuilding of Lambeth Bridge and Chelsea Bridge; Putney Bridge has been widened, Waterloo Bridge and Wandsworth Bridge are being reconstructed; entirely new bridges have been built at Twickenham and Chiswick (on the New Chertsey road), and the unsightly old bridge at Hampton Court has been replaced by a handsome new structure designed by Sir Edwin Lutyens to harmonize with the historic setting in which it is placed. Valuable as these improvements are, they admittedly consist, for a great part, of the restoration or enlargement of facilities previously neglected.

The Charing Cross Bridge scheme remains in abeyance, and in my Report I have expressed an adverse opinion upon it, owing largely to the presence in south London of that conspicuous nightmare the Elephant and Castle, a bewildering road-junction upon which the approaches to seven London bridges already converge. If a new road-bridge were built at Charing Cross we should only be adding one more spoke to the wheel of which the Elephant and Castle is the overloaded hub. Similarly on the north side of the river it appears impossible to provide a Charing Cross Bridge with independent approaches, I mean approaches which are not common to other bridges. And here let us remember that the densest congestion prevails not on bridges but on the approaches to them. Moreover there are sound reasons for endeavouring to deflect traffic from central London rather than increase the pressure there by providing additional bridges. The cure for the traffic paralysis at the Elephant and Castle is not the construction of another bridge discharging an additional stream of traffic into this distracted road-junction, but the building of a high-level north–south road which would give drivers an unimpeded course, clear of the local traffic which chokes the streets at surface-level. If the design of this high-level road comprised, as it should, the concurrent planning of buildings on adjacent sites, the viaduct, far from inflicting injury on the local landscape, would enhance its somewhat questionable charms. The dangers of the local streets would certainly be reduced by the relegation of through-traffic to a high-level road.

River-side roads

Any one who, like myself, has been called upon to undertake a study of our road system must often feel astonished at the complete indifference displayed in various stages of London's development to the subject of road-communications, even in modern times. Nowhere is this neglect more patent than in the river-side area. One might instance as an example of this want of foresight the Surrey Commercial Docks, of which the quays measure nearly 9 miles in length and which are entirely served by narrow roads, best described as tortuous lanes. The same remark applies to the London and St. Katherine Docks, with 4 miles of quays. This group of docks is bounded by jagged

Greater London Traffic Area: principal road schemes

narrow thoroughfares like Upper East Smithfield, barely 30 feet wide. The squalid purlieus of Billingsgate Market and the Custom House are so cramped that the adjacent streets and alleys are almost impassable at busy times of day.

Recommendations

It was only therefore to be expected that many of the recommendations in my Highway Development Report should be directed to the river-side area, and I will now describe some of the outstanding proposals. Rather than advocate a Charing Cross Bridge which, as already explained, would, in my judgment, only aggravate traffic congestion in the busiest parts of Westminster and Lambeth, I have preferred to stress the need for improved means of access to other less central river crossings, believing that if these could be more fully utilized the pressure on Inner London would be relieved. In many instances to-day the approaches to Thames bridges and tunnels are so inadequate and of such short range that drivers from a distance hesitate to include them in their itinerary. The Blackwall Tunnel is a case in point, and now that it is to be duplicated, a readily recognizable road should be formed, linking it with a new East–West Connection in the north and with a new South Circular Road in the south. As the East–West Connection will afford an unobstructed route 12 miles long from Hammersmith to Leytonstone, and the South Circular Road will form a loop from Woolwich to Wandsworth, it is clear that if the Blackwall Tunnel approaches can be extended to these two great thoroughfares, the popularity and utility of the tunnel will be greatly enhanced. Similarly when the Rotherhithe Tunnel is duplicated, as it soon must be, the approaches should extend uninterruptedly and unmistakably from the South Circular Road to Stamford Hill. The new approaches to both tunnels would be carried for considerable distances on viaducts, certain lengths of which could conveniently be superimposed upon existing railways.

The Woolwich Ferry should eventually be superseded by a tunnel with lengthy and simple approaches from the north (on the south, satisfactory access will be afforded by the South Circular Road). Wandsworth Bridge, which is now being rebuilt, will have an adequate southern approach from the South Circular Road, but on the north side of the river the access through Fulham is devious and narrow. By the adoption of the recommendation made in the Report, a route would be created placing Wandsworth Bridge in direct communication with Kensington, Willesden, and Hampstead. Battersea Bridge, when widened, should be made part of a somewhat similar route, nearly 7 miles long, extending from the Streatham district in the south to a point on the East–West Connection in Marylebone. As part of this scheme, a tunnel about a mile long would be driven under Kensington Road, Kensington Gardens, and the Bayswater Road, so that north–south traffic would be spared the delay created by any attempts to cross the two principal streams of east–west traffic in London. Incidentally, such a tunnel would do much to promote the quietude of Kensington Gardens for many years to come. It would be so planned as to play a useful part in a comprehensive metropolitan scheme of defence against air raids.

Lambeth Bridge is hampered by particularly awkward approaches from the Victoria neighbourhood. Horseferry Road, into which the bridge

directly discharges, only extends for a quarter of a mile and then loses itself in a tangle of small streets. Horseferry Road needs extending westwards to South Kensington, by-passing Victoria on the way. Further value would be conferred upon Lambeth Bridge if a spacious thoroughfare were opened out across south London from Lambeth to London Bridge—potentially the shortest route from the City to Westminster. This improvement should be coupled with the drastic remodelling of the deliriously chaotic area round London Bridge Station.

Two other river crossings have already been mentioned, namely the Lower Thames Tunnel at Dartford and the proposed new bridge at Egham. Fortunately these will be amply served by the North and South Orbital Roads, in which they form indispensable links.

A glance at the plans annexed to my Report will, I hope, disclose the advantage presented by a series of deflecting roads and ring routes as the principal cure for London's traffic disease, in preference to the prescription of more obvious local palliatives which would, I fear, only result in drawing additional traffic into the most congested central areas.

London's dock areas

London's dock areas are, as already mentioned, generally lacking in suitable road access, and several of the recommendations made in the Report are intended to remedy this defect, as for instance the suggested road leading from the London Docks northwards to Stoke Newington. This would parallel and relieve the Bishopsgate–Shoreditch road and would thus help to keep traffic out of some of the most densely crowded quarters. Another new route serving a similar purpose would extend from the West India Docks northwards to Stamford Hill, thus again offering drivers an inducement to keep clear of the City. Many of the areas that would be traversed by these new routes are so woefully dejected and so stricken with decrepitude that the wholesale demolitions and consequent re-planning which the building of a wide new thoroughfare would entail could only be regarded as a boon that is long overdue.

For the benefit of the most imposing group of docks in London (Victoria and Albert and King George V), it is proposed that a new route should be carried northwards from Silvertown through parts of West Ham, Leyton, and Walthamstow, which are fully ripe for replanning. Industrial developments in these areas render it imperative that better road communications should be established up the Lea Valley, and the route I have just described has been designed with that end in view. It would pass up the Lea Valley, skirting the Metropolitan Water Board's reservoirs, and intersect the North Orbital Road near Hoddesdon in Hertfordshire. At a later stage I should hope that this Lea Valley route might again be extended still farther north to join the London–Newmarket road near Great Chesterford, thus providing London with a new outlet in a northerly direction.

Embankments

The Thames embankments deserve special mention, not merely because of the pleasure they afford as a promenade, but also because of their outstanding advantages from a traffic standpoint, inasmuch as the presence of

the river along one flank relieves the route from intersecting streets and frontage development. The Victoria Embankment, which now terminates so lamely in the east at Blackfriars, should be extended to the Tower, where it could be admirably linked with the Tower Hill Improvement, which is being so generously fathered by Lord Wakefield. From the Tower a new route would be opened out into Whitechapel at a point east of Gardiner's Corner, where incessant congestion now prevails. Traffic that now blocks the approaches to the Mansion House would be deflected to the river-side route.

Turning to the opposite point of the compass, the Chelsea Embankment, which now comes to an ignoble end under the grim shadow of a power station, should be widened and continued to Putney Bridge. Thanks to these two embankment extensions London would be able to boast of the priceless advantage of a river-side promenade stretching for nearly 8 miles from Putney to the Tower, and giving our visitors a worthy impression of the grandeur of the Thames. It should not pass the wit of man so to replan the river-front along new sections of the embankment as to provide space for handsome blocks of buildings separated by spreading lawns—reminiscent of that very sanguine picture of an earlier London:

> "Small and white and clean,
> The clear Thames bordered by its gardens green."

Conclusion

No greater privilege could have been conferred upon me than the task of attempting to replan London's highway system so as to adapt it for the great future which we all believe lies in store for our capital. In carrying out the task I had the advantage of studying the work of many predecessors and colleagues. The labour has not, I think, been entirely in vain, and I fully believe that some solution will be found for the thorny problem of apportioning the cost of this great programme of works. It appears at any rate to be generally recognized that some governing road plan ought to be observed by the one hundred and fifty local authorities controlling London's destinies. We are compassed about with a great cloud of witnesses. To our kinsfolk overseas, London is the heart of the Empire, the centre of the universe, the model of a great city. Would that the model had fewer blemishes!

The adaptation of London to modern needs is accordingly a matter far transcending the narrow interests of individual local authorities. The highest interests of the Empire are at stake. By fearless and enlightened replanning we can display London to the world as an unchallengeable token of our national ability to govern, control, and administer, with a high sense of duty, the great possessions that we hold in trust from our virile ancestors.

DISCUSSION

The CHAIRMAN (Professor KENNETH MASON): I have this afternoon to introduce Sir Charles Bressey, who is going to open a discussion on the Greater London Highway Development Survey. We have all seen the Report discussed in the Press and have heard Sir Charles Bressey during a Discussion earlier in the Session.

Sir Charles Bressey read the paper printed above, and the following speakers then contributed to the discussion.

Mr. ALKER TRIPP (Assistant Commissioner of Police, Scotland Yard): I am pleased to be able to add a few words on a subject of great importance to my work, which concerns the circulation of London traffic.

I was glad that Sir Charles Bressey introduced the subject by stressing the importance of London's river. That is, I believe, the starting-point of all our ideas of circulation of traffic in London. When a town grows up round a river its road development generally takes one of two forms: it is either on a cellular basis or a radial basis. If the river is the chief support and sustenance of the township, there will be a cellular or rectangular development. If, on the other hand, the town is linked with various other towns by way of overland routes, the radial plan will automatically be developed. We have now in London both types, the cellular combined with the radial, which is the worst type of town plan because it introduces such an enormous number of awkward junctions. Washington was deliberately planned upon those lines and has greatly regretted it. Chicago has grown up largely on that type and is experiencing serious difficulties as a result.

The river is not only a highway for water-borne traffic, but, as the interchange between town and town has developed, it has become more and more of an obstruction to road-borne traffic. In modern times those who have been bent upon the improvement of London have too often been hypnotized by this obstruction, and have therefore said, time after time: If we want to have an improvement, let's build a bridge. Sir Charles Bressey has referred to Charing Cross Bridge, and has condemned it as unnecessary. He based his condemnation, it is true, upon the inability of the Elephant and Castle to absorb more traffic, and only referred *en passant* to the effect upon the West End. But I think the Elephant and Castle area could be easily adapted to modern needs, whereas the West End, if flooded with the new traffic that such a bridge would carry, would be unable to cope with it. It is seldom realized that bridges are the least obstructed thoroughfares in the whole of London, there being no problem of cross-traffic nor of standing vehicles. The statistics as to bridge traffic are interesting. As a result of a census of traffic taken at peak hours it was found that Westminster Bridge was carrying only 40·2 per cent. of the traffic which it could carry; London Bridge, heading the list, had 48 per cent., while Southwark Bridge had only 25·9 per cent., and so on.

The better way, as mentioned in the paper, is not to build new bridges for Inner London so as to lead more and more traffic into the central area, but to divert traffic from the centre by means of ring roads. The latter process is already taking effect; there was, when Sir Charles Bressey took over his task, a North Circular Road very largely developed, if not almost completed, and there was the North Orbital project. The South Circular Road was also to some extent projected, and Sir Charles has introduced a South Orbital Road also.

It seems to me that one of the most important works of all those suggested by Sir Charles Bressey is an inner ring road, which consists of portions of various projects of his. This ring route is based upon the east–west artery (Scheme No. 1), whence it runs by way of King's Cross Road and the line of Blackfriars Bridge to St. George's Circus, thence along the Lambeth Road, turning north and continuing north of Victoria to Grosvenor Place and thence running up the boulevarded East Carriage Road of Hyde Park to link up with Scheme No. 1 at Marylebone Road. That possibly is the most urgent need of London at the moment. Sir Charles has also linked this ring with another

circle, the course of which runs down King's Cross Road, and thence from Blackfriars Bridge along Thames Street and out beyond Gardiner's Corner in the East End, and turning northward through Whitechapel along a line somewhat to the west of the existing Cambridge Road towards Hackney and so to the east–west route which is his No. 1 Scheme. I hope we shall see those two schemes very much in the forefront of the execution of Sir Charles Bressey's proposals.

Some critics have complained that London will undergo so much transformation that it is no good budgeting now for so long a period as thirty years. The answer is that a master plan is wanted if we are to avoid chaotic development, and if we are to have any scheme at all, this is the scheme. I think most of us agree that, for a general town lay-out, much the best plan is the radial plus circular. Sir Charles Bressey's scheme, although necessarily not on wholly symmetrical lines, presents us with a very good specimen of this. It is an inherently sound town plan giving good interchange between point and point. Whatever transformation the London area may undergo therefore, I suggest that, from every point of view, we shall be well advised to put our money on this scheme and to do all that we can to further it.

Mr. PERCY LOVELL (The London Society): I am glad to have the opportunity of adding a few words representing the voluntary societies' point of view. Though there is a certain amount of criticism of detail, we do appreciate the great work that Sir Charles Bressey has done, not only during the past three years but during the period before that when he was the engineer responsible for a great many of the roads that have been recently constructed round London.

There is one point which always rather frightens us in reading his Report. It is the expression he uses now and then that "this road will pass through land ripe for development." The whole of London has developed too much recently, and we hope that in the case of roads which pass through those rural pockets to which Sir Charles also refers and "land ripe for development," the fullest advantage will be taken of the powers given in the Town Planning Act for controlling them. Last year we arranged a drive through the Essex section of the Green Belt; that Essex section now is in open country, but of course if the development that usually follows road building takes place the Green Belt will become what it really is—a narrow belt. A good deal of the adjoining open country will disappear and developments may come right up to its edges. A great deal of the beauty of that Green Belt will vanish if care is not taken in the planning of the development which takes place.

May I go back for a moment to the days of one of Sir Charles Bressey's predecessors, Colonel Hellard—about the years 1910, 1911, and 1912? I believe I am right in saying he practically was the Traffic Branch of the Board of Trade. I do not think he had much, if anything, in the way of a staff, but he had very good feet and very strong boots, and he tramped all round the districts of London in those years to prepare what he felt to be the line of the new roads which were wanted in the outskirts of London. In course of time the plan he got out was adopted by means of certain conferences over which John Burns presided in connection with the Local Government Board. During the War it had to be put aside, but eventually it became the backbone of the roads which have recently been constructed around London.

Then in about 1918 Sir Aston Webb lectured to this Society, as Chairman of the Council of the London Society, on what we called "The development plan of Greater London." In that plan we suggested that roads should not be considered only as roads but as part of the districts through which they passed.

Though we could not plan all the districts in between the various roads, we did try to show on the plan which Sir Aston Webb described open spaces considered as part of a plan for Greater London. Unfortunately very few of the open-space suggestions were carried out, for there were not then the same possibilities of control.

The same principles apply in the case of new roads through the built-up areas—and in connection with the western exit from London through Hammersmith we, in conjunction with the Royal Institute of British Architects, organized a competition between the two town-planning schools in London, and plans were produced which showed this great road considered, as far as it was rationally possible to do so, in conjunction with the districts on either side, showing how the best could be preserved and the worst houses pulled down and sometimes replaced by open spaces. Sir Charles Bressey came to look at the plans and to make interesting criticisms on them before we actually announced our award.

Mr. EDWARD FRYER (Deputy-Secretary, The Automobile Association): We have all, not only from the motoring point of view but also from the development point of view, taken considerable interest in Sir Charles' work in connection with the Survey of London. As soon as the draft was available one of the first things that the Motor Legislation Committee did was to decide what action could best be taken to implement the Report. We want better roads and better transport facilities, and we want them in our time. The trouble is that even some of the routes which are indicated as being necessary for Sir Charles' roads are now built up by big blocks of flats. I have been going into land values from the point of view of traffic roads, and whereas it might be said that in certain parts land some years ago was worth about £3 or £4 per acre, we have now sites in London which are worth £1,000,000 an acre. The same applies to the country.

I hope that as a result of this discussion we may be able to energize the London County Council and the Ministry of Transport, because it largely turns on finance, to get the projects outlined by Sir Charles' Survey put into operation; not in bits and pieces, but as an entity. From the point of view of traffic flow we want to get from our place of origin to our destination as freely and as fluidly as possible, without cross-traffic or traffic lights, halts, and so on. And it is not because we wish to travel fast. Sir Charles said that his purpose was to show how we could deflect from the congested area. I submit that the only practical way—other than by control in an arbitrary manner, more regulations for closing streets, and so on—is by having new, suitable, and sufficient arteries to attract the traffic which does not want actually to go into the central area.

Mr. Tripp referred to experience in America with regard to rectilinear development. So far as London is concerned, when considering parts of the city which have historic interest and through which no through-traffic should want to go, it seems to me that London requires not rectilinear development and not necessarily the ring road development, but something more in the nature of a hexagonal mosaic.

Sir Charles also referred to the importance of the Thames. I have read the evidence in connection with Charing Cross Bridge, to which Sir Charles referred in his paper. I gave evidence in support of that bridge on the understanding that it would be a link in the through-traffic coming up from Dover and Folkestone, crossing London, to link up with Coventry, the Midlands, and the North. There is the main artery which would carry those lines of traffic in both directions.

Sir Charles referred also to the advantage of the Thames Embankment for east–west or west–east traffic. When Chelsea Bridge was being rebuilt I found myself going home one evening at an actual average of 1·5 miles per hour, not because of the traffic coming in or leaving the Embankment, but because of the congestion at the intersection, the mere fact that Chelsea Bridge was closed for reconstruction, and other traffic had to go over Albert Bridge or Battersea Bridge. When Chelsea Bridge was rebuilt, except for acquiring land controlled by certain interests, it could have been built almost as cheaply by going over the Embankment, the Embankment carrying on underneath and forming what one might call a fly-over junction.

Colonel MERVYN O'GORMAN (The Royal Automobile Club): The sole purpose of a town, and the objective of those who live in it, is quick access between the citizens. In the past, quick access (or nearness in time) could not be got without the nearness in position that no one really wants; to-day, with the motor vehicle, it can, on two conditions. Slow and dear transport must be changed to quick and cheap. Slow and dear transport has always obliged the workers to crowd their dwellings "near in" to avoid the daily delays in transit that cost Londoners £20,000,000 per annum in wasted waiting time. It is a business maxim that "slow transport is dear transport," and there is from 10 to 40 per cent. of transport cost in every retail price.

Since 1905 there have been nine committees and reports on the slowness of London traffic. Between them they have recommended unified control, a unified plan, and funds to carry it out. Sir Charles Bressey's is the latest, but we are doing nothing.

The first thing is to safeguard all the sites of his through routes, for that alone can ensure the plan as a whole. Snippets from this plan by widening particularly crowded streets are not helpful. Delays are born at crossings: a bit of widened street brings a fatter queue of vehicles to the crossing that originated the delay. Delays are increased by such a widening. Fluid through movement is what London's life needs, but the local owner of the local shop should not be expected to pay an extra highway rate, for a through route may carry his clients farther afield. Through routes must be paid for and administered by a single London Authority, following the precedent of the trunk-road scheme for analogous reasons. The L.C.C. are right in standing out for 100 per cent. grants for through routes, but they are failing to appreciate the urgency. They have given it no publicity, and the sites for the through routes are being built upon.

Every means to fluidity must be forwarded. Our street-name plating is so bad that a Parisian asked if the names are State secrets. Every beacon pole should be topped by a road name instead of a lemon. Most pedestrian crossings should be a subway (and incidentally an air-raid shelter). Every Government office, post office, theatre, and store should provide standing for its clients' vehicles. Every traffic unit should be made to keep left always.

My fear is not only that the Bressey plan will be ignored. The danger is that any plan may be doomed to death by neglect.

Mr. REES JEFFREYS (Chairman, The Roads Improvement Association): We who have laboured for many years at the problems of London transport are grateful to Sir Charles Bressey, not only for his paper this afternoon but for his part in producing the Survey which has been the subject of discussion.

He has shown in outline what new and improved roads are needed in Greater London, but the problems which he was bound to avoid are: Who is to plan? Who is to pay? Who is to execute? It is because at no period in the history of London have these questions been faced that we are in this chaos of transport

and traffic to-day. In spite of Sir Charles Bressey's excellent Report, I see little hope of it being carried out as a whole in our lifetime unless these questions are faced. The execution is a small matter, given a plan, the direction, and the money. But in Greater London there are one hundred and fifty local authorities, all with independent jurisdiction. It has been impossible to get necessary schemes through at any reasonable speed. I could give many illustrations. If I averaged them all I should say that most of the London schemes of arterial road construction and improvement have been carried out about twenty years after they were deemed desirable and necessary. And when they are finally carried out the cost is anything from three to ten times as much as they would have cost if they had been carried out at the time they were deemed desirable.

Like Sir Charles Bressey, I was at one time a Government official and had to investigate these matters. In one case I took out figures in regard to improvements carried out by the Metropolitan Board of Works and the London County Council in its earlier years, and I found that 90 per cent. of their expenditure went in land and compensation and only 10 per cent. in works.

I cite a specific scheme with which I was associated because it illustrates how, if you want these works essential to the life of London as a great city carried out, you must take the problems of transport out of politics. In 1903 I put before the Royal Commission on London Traffic the scheme for the Western Avenue. We recently heard that a grant was being made by the Ministry of Transport to enable the last section to be carried out. The Western Avenue starts somewhere near Wood Lane in the County of London and finishes in Buckinghamshire just beyond Uxbridge. As a result of the 1903 Royal Commission the London Traffic Department of the Board of Trade was set up, and Sir Herbert Jekyll, followed by Colonel Hellard, blessed this particular scheme on the lines in which I had put it before the Royal Commission. Nothing happened. Then in 1911 the Arterial Roads Conference was held. The scheme was approved again, but again nothing happened. About 1919 a start was made. My swan-song as a Government official was to help to get the Government to agree that road-building was proper work on which to employ certain of the demobilized soldiers, and for this reason £9,000,000 was provided to find road work for those men. It was necessary to get the authorities of London, Middlesex, and Buckinghamshire to cooperate, and that has been a work of years, achieved finally through the tact of Sir Charles Bressey. The last grant has now been made and we shall eventually have completed in 1941 a road deemed necessary so long ago as 1903. Imperial politics also intervened. Tenders had been advertised for a section of the Western Avenue when the Chancellor of the Exchequer raided the Road Fund, and the successful tender was held up.

I would suggest that this planning should be carried out by a competent authority consisting of a few experts. Actually Sir Charles Bressey's schemes are already out of date. You have been told that some of the sites included in his scheme are now being built over. There must be a permanent commission to study and solve the problems of regional transport as they arise. Therefore I submit that until Greater London—London and the Home Counties—has a statutory transport commission or a highway commission which has the one duty of planning schemes of regional importance, has funds at its disposal, and has power to determine, when a scheme affects more than one county, that it shall be carried out, there will be no reasonable progress.

Sir CHARLES BRESSEY: Instructions were given me by the Government to prepare a scheme for thirty years ahead. These were the terms of reference

which avoided the topic of cost. The House of Commons would not allow the Minister of Transport to get away with that, and estimates had to be furnished in reply to a parliamentary question. The approximate mileage covered by the scheme is 818. The estimated cost ranges from £160,000,000 to £230,000,000—a very wide margin, because values change and landscapes alter. It means £160,000,000 if the work is started at once; £230,000,000 if put off for a lengthy period.

I was particularly glad to hear a tribute paid to Colonel Hellard. Before the War, I wandered over the fields in Essex with him in connection with some schemes in which he was interested. Carrying on with an exceedingly small staff, he prepared his arterial road plans. When my chief, Sir Henry Maybury, returned to London after the War as Director-General of Roads, I was on his staff, and suggested, when unemployment was rife, that we should take charge of the whole of the plans and try to get them going for the relief of unemployment. Mr. Lloyd George was the driving force, and the Ministry of Transport arranged for the carrying out of the schemes, with many extensions, such as the Watford By-Pass, but in their origin the schemes reflect great credit upon Colonel Hellard.

Whatever may be said of the difficulty of planning highways in advance, there is always this to be said for a good road: it is a good road whether the population decreases or increases. Look at The Hague, for example; the district is not extremely populous, but the laying out of that town with wide roads and boulevards is a good thing in itself, even if there is not an enormous increase in the traffic.

Mr. Lovell referred to the need for preserving the surroundings of our roads and hinted, to my surprise, that I had not discountenanced building developments. I went out of my way to deal with that question. On p. 62 of the Report, referring to one scheme in particular, I said: "Designed in accordance with modern principles, with all cross-roads bridged, the new route would be safe for high-speed traffic and free from the inevitable restrictions which fetter the road engineer in improving an existing obsolete highway. An unstinted width of land could be acquired at agricultural prices, and frontage development would be rigorously controlled. Thus would be obtained an up-to-date highway developed on parkway principles and providing access at selected points to future satellite towns. These remarks apply with varying degrees of force to other main roads radiating from London."

Mr. Rees Jeffreys is an expert on finance, which constitutes the crux of the position. My feelings in the matter are not so despondent as his. We have lived to see a great many schemes carried out, and the fact that the Government made an offer of 60 per cent. on three schemes costing £16,000,000–20,000,000 indicates that there is no desire on their part to shirk their responsibilities. I have great faith in the London County Council, and am glad to think that one of the leaders is Mr. Herbert Morrison, whom I had the honour of serving when he was Minister of Transport. I have no misgivings as to the future. I believe that many of the schemes will go forward, and even if London should spread no farther I still believe that better roads will add greatly to the pleasure and convenience of those who live in London.

One last word, and that is an expression of gratitude to the local authorities of London who have unstintingly assisted me in the preparation of the Report. In no single instance was I refused any information, plans, or consultation. The behaviour of the officers has been beyond praise. There might have been a certain feeling of annoyance at the intrusion of a mere Government officer, but if so it was carefully concealed; and, as an indication of the courtesy of the

London County Council, a free hand was given me to select slides to show this afternoon.

The CHAIRMAN: It only remains for me to ask you to thank Sir Charles Bressey for the exposition of his extraordinarily bold and constructive Report on the Highway Development Survey of London. There has been a unanimous expression of opinion in its favour. No one has offered criticism. Indeed, the only body likely to do that would be the Ancient Guild of Watermen and Lightermen, who at one time obstructed any development on land in London. On the other hand, the scheme should have the support of the Worshipful Companies of Brewers and Vintners, who might consider the development of some new area similar to the Elephant and Castle, on the outskirts of Greater London.

I ask you to accord a hearty vote of thanks to Sir Charles Bressey.

Sir Charles Bressey's paper was illustrated by many photographs of London which cannot at the present time be reproduced.—ED. *G.J.*

THE LAKE RUKWA EXPEDITION, 1938

V. E. FUCHS

THE last description of the Lake Rukwa region was given to the Society just forty years ago, by Captain F. F. R. Boileau and L. A. Wallace,[1] but it had been first visited by a European seventeen years before. Lake Rukwa lies in the south-western part of Tanganyika. It is a fairly large lake some 80 miles in length, but dwarfed by its proximity to lakes Tanganyika and Nyasa, both of which are several hundreds of miles long.

The name Rukwa first appears on Burton and Speke's map of 1858, and presumably Speke heard of it when on his way to the southern end of Lake Victoria. The reports which he received seem to have described the lake as a wide extent of swamp sometimes connected with Lake Tanganyika. In 1867 A. G. Findlay wrote of certain caravans, saying: "These cross, or pass, a shallow morass or lake, the Rukwa Lagoon, which at times joins the Tanganyika Lake." Again this was hearsay, as was the description in Cameron's letters published in the *Proceedings R.G.S.* in 1874: "Some of the surplus water of the Tanganyika is reported to drain off, in the rainy season, by way of the Rukwa lagoon or swamp, during which time Rukwa is impassable." Cameron adds: "I suppose Livingstone will have found out about this in his present journey." Livingstone however had been unable to continue his journey in that direction, and was compelled to turn south and west through the swamps of Bangweulu.

Joseph Thomson in 1880 was the first European to see Lake Rukwa; in his own words: "We had the pleasure of being the first to see that curious lake, named variously Rukwa, Likwa, and Hikwa, which has assumed so many shapes in the fancy of different travellers and geographers, and which we have now taken the liberty to call Lake Leopold. We saw it from an altitude of about 8000 feet above the sea, its surface lying more than half that height beneath us, and the mountains rose in such perfect precipices all round that it seemed as if we could throw a stone into it." But though Thomson travelled the whole length of Ufipa and crossed the Kawu (his Mkafu) at the northern end of the lake, he never visited it. In 1882 Dr. E. Kaiser was surveying to the north of Lake Rukwa, and in October he reached the lake at Ukia, thus being the first person ever to stand upon its shores. His notes and a map were published after his death in *Mittheilungen der Afrikanischen Gesellschaft in Deutschland*, 1883–85. Then in November 1889 H. H. Johnston, with his assistant Nicoll, crossed the Songwe valley to Iwungu, joining up with Dr. D. K. Cross, who later became the second person to reach Lake Rukwa, this time at the extreme southern end. After some trouble with the chief at Iwungu, Johnston returned without going down to the lake itself. From 1889 onwards I can find no mention of any visitor to Rukwa till Captain Langfeld visited it in 1897 and was followed by others, including Captain Ramsay and the 1898 Boundary Commission. Then at the beginning of this century missionaries began to enter the area, and to-day there are several stations round the lake basin, some of them in

[1] *Geogr. J.* 13 (1899) 577–623.

the more remote districts. Since then a number of people have travelled there, but even so the country remains poorly mapped and comparatively inaccessible—certainly to people who are only prepared to travel with motor transport. Thus it can be seen that the Rukwa region is not an unknown country, but like many other places in Africa the greater part of it is seldom visited by Europeans, and knowledge of the valley as a whole has been very limited. Perhaps the most complete account was that given to the Society by L. A. Wallace in 1899, mentioned above.

The Lake Rukwa Expedition of 1938 was organized mainly for geological work in what was a little-known part of the great African rift valley. Our party was a small one, consisting of Dr. and Mrs. MacInnes and myself, but later we joined forces with Mr. A. M. Champion and Mr. C. Gillman, both of whom have spent so many years in East Africa that their company and advice were invaluable to us. The expedition was financed by the Royal Society, the Trustees of the Godman Fund of the British Museum, and the Royal Geographical Society, which also lent all the instruments we used. I should like to express our thanks to the Tanganyika Government for the assistance afforded to the expedition, also to Mr. Wade, of the Geological Survey, and to Mr. MacMahn and Mr. Northcote, Provincial Commissioner and Acting Provincial Commissioner of Mbeya, for all the help which they gave us. We also owe much to many other administrative officers, in particular Mr. Wilkins and Mr. Millard, who went out of their way to make things easier for us. I must also express our gratitude to Mr. and Mrs. Bayldon, of Rukwa Mines, who allowed us to use their camp as a base when working on the east side of the lake, besides giving us a great deal of help in other ways. Finally I would like to thank Professor O. T. Jones and Professor Stanley Gardiner for their assistance and advice before the expedition left England.

The title Lake Rukwa Expedition is perhaps misleading, for we were scarcely, if at all, interested in the lake itself, but rather in its basin, because it forms a part of the rift valley. That it is the northern part of the Nyasa trough has often been pointed out, and at present it is separated from Nyasa by a range of volcanic mountains that cross the rift from east to west.

Rukwa itself lies approximately between lat. 7° 30′ and 8° 30′ S., and long. 32° and 33° E. This year it is about 80 miles long and 15–25 miles wide, but since the beginning of the century its area has been known to fluctuate widely. As recently as 1929–30 its maximum length was about 30 miles. Such fluctuations are due to comparatively small changes in depth, something of the order of 10–15 feet. As the lake has a closed basin these fluctuations may be considered to be a direct reflection of the variation of the precipitation over the basin. Incidentally they show the origin of the reports received by Speke, Cameron, and others: that Rukwa was a swamp impassable during the rains.

Early in March we arrived at Mbeya, the administrative centre of south-western Tanganyika. The township lies under the southern end of the range from which it takes its name. Where ten or twelve years ago there were only two or three government buildings there is now a flourishing centre with

shops and garages, besides an airport used by air liners on the inland African route.

Looking north from the town one sees the great rocky hog's-back of Mbeya, where the highest point rises to well over 9000 feet. Above 8000 feet during the rains the grassy slopes are brilliant with flowers: red-hot pokers, beautiful blue-and-white *Moraea* (irises), white delphiniums whose scent is reminiscent of lilies of the valley, and innumerable orchids. The profusion was so great that Mrs. MacInnes was able to collect seventy-five species in less than two hours. The mountain peak itself is a narrow *arête* falling away sheer for 1000 feet or more on east and west. Through the swirling mists that enveloped it in March we had our first view of Lake Rukwa, which appeared as a rather disappointing sheet of shallow water bounded by low-lying grass flats.

Though the lake has no outlet the water is only slightly brackish and, like so many other African lakes, it measures the progressive desiccation of the region. Up to approximately 300 feet above its present level, old lake beaches are found, and though earth movement may well have depressed the floor of the basin, there is evidence to show that the water has fallen at least 250 feet as a direct result of diminished precipitation. There is considerable fluctuation in the lake-level over a period of years, and it seems probable that the general trend is still towards a reduction of the lake. With the present annual rainfall of about 40 inches there seems no immediate danger of this desiccation affecting the local population. Nevertheless in two generations the inhabitants of the region may well be concerned about their future.

While camping near Mbeya Mountain we were in the country of the Wasafui tribe, who proved to be a curious mixture of superstitious timidity and peculiar obstinacy. Considering that they have been under missionary influence for some thirty years and live in close proximity to numerous European settlers, it was remarkable how frequently they ran away at our approach. One of them whom we employed for some time told me that our visit to the top of the mountain, in addition to my peculiar habit of chipping the rocks, had brought us very nearly into the category of devils. Fortunately the only serious result of this was a temporary shortage of eggs and vegetables in the kitchen.

Because the rains were in progress at the time of our arrival we made a stay under the west flank of Mbeya Mountain, where the Archaean rocks are bordered on the south and west by volcanics. Everywhere we found tall grass and dense vegetation which made walking difficult and obscured geological exposures until one actually stumbled upon them.

Travelling westward from the mountains through the Msafui country one passes over a gently undulating plain that slopes towards the north. At one time this was the floor of a greater Lake Rukwa; to-day it is cut up to a depth of several hundred feet by a number of streams, of which the largest is the Songwe river running along the foot of the escarpment that bounds the plain on the west. For some distance the river flows in a deeply incised valley with sheer red cliffs of what are presumed from their appearance to be Karroo rocks, but no fossils could be found to verify this. The Karroo is capped by some feet of the white aqueous ashes which otherwise fill the valley from side to side. On the day during the rains when I crossed the Songwe, the

river at the ford was some 3 feet deep and 15 yards across. On the west side I came to some large caves in the limestone of the cliff, which proved to be a tufa, and had presumably been formed by primary waters rising along the local fault plane. To-day some of the caves are being excavated for the bat-guano which they contain, while the rock itself is used in the manufacture of lime.

At the end of March we removed our camp to Marambang'ombe, near the south-east corner of the lake. There we had been invited by Mr. and Mrs. Bayldon to make use of their permanent camp as our base for the journey which we proposed to make up the east side of the lake. The only journey on the east of Rukwa of which I can find a record is that of Wallace in 1890, who cut across the dry lake bed from Manda to Ukia. We intended to go beyond Manda to the farthest point of the basin as marked by the curve of the Rungwa river.

On the way to our starting-point we passed through Chunia, the township centre of the Lupa goldfield. Originally this was an alluvial field, but during the last few years it has become increasingly difficult for the alluvial miners to pay their way. Indeed it seems that only those employing large numbers of natives make a steady profit. Perhaps the chief difficulty with which the alluvial digger has to contend is the lack of water for washing during the dry season. In an attempt to overcome this loss of working time many are now using "dry-blowers," consisting of a motor-driven fan which supplies a blast of air to remove all the lighter material, leaving the gold and heavy rock fragments to be sorted by hand. The latest method of digging is to use a huge tractor which pushes in front of it a scraper for skimming off the surface of the ground, after the manner of a snow-plough. The material so collected is fed to a battery of a dozen or more dry-blowers. There can however be little doubt that the future of the field lies with those mines which are crushing ore from the numerous reefs, thereby getting a steadier yield if not the spectacular discoveries occasionally made by the alluvial miner.

On March 25 we arrived at Bayldon's Rukwa "A" Mine on the Marambang'ombe river, the most northerly mine of the Lupa goldfield. There we were comfortably housed in some of the permanent buildings attached to the mine. This was most fortunate, as our stay was rather a long one on account of the non-arrival of the porters for whom we had arranged more than a month previously. Instead of leaving on April 1 as we had planned, it was impossible to start until the 10th. During those ten days we divided up our belongings into suitable loads and thereafter made use of the time for collecting insects, reptiles, etc., besides taking the opportunity to visit the mine shafts and other places of geological interest. After much correspondence with the Wawungu elders because of the alleged disappearance of the chief, men began to come in by twos and threes till, on the morning we proposed to start, we had our full complement of forty-five, including two head men. Judging from Austin and Cross's experience in 1889 and the more recent experience of the local administration, we should perhaps have expected these difficulties with the Wawungu. However, once on the way they proved themselves to be excellent porters. All told our party numbered fifty-three. For ourselves and our personal servants we carried food, but the porters had

to be fed along the route and our range was accordingly somewhat limited, for not only is the country sparsely populated on account of tsetse fly, but the year's crops were scarcely ready.

From Marambang'ombe we made our way down to the lake shore over the very precipitous 250-foot escarpment which here forms the eastern wall of the Rukwa rift. Despite the steepness of the scarp, it is densely covered with vegetation, like all the rest of the country. Actually there are plenty of exposures on the cliff itself, but it is unfortunately impossible to judge anything of its nature from a distance.

The fracture which forms the escarpment runs from the Mbeya range in the south in a general north-west direction, and appears to be due to a normal fault hading 46° to the south-west. The extreme freshness of the fracture can be seen from the fault breccia which in places can still be found on the face of the scarp. It has been suggested by Dr. Grantham, of the Tanganyika Geological Survey, that the freshness of the scarp is due to its preservation beneath the waters of Lake Rukwa when they stood at a sufficiently high level to drown it. Though this may be the case, there is also evidence to suggest that the scarp itself was not formed till late in Pleistocene times. The rocks through which the fault cuts are schists of the Basement Complex, here and there injected with granites, as at Saza, and again north of Ngila. At the foot of the scarp there is a flat swampy strip of country only a very few feet above lake-level, which is here and there relieved by old delta deposits banked against the scarp where the rivers once flowed into the lake when it stood at a higher level. To-day these deposits have been cut into as the water-level dropped, the rivers thus forming deep gorges in their onetime deltas.

During the last few years the steady rise of the lake has inundated the low-lying country below the scarp and made many of the old native tracks impassable. Consequently our route led us up and down the escarpment till finally at Uleia, on the Kikamba river, we marched away from the lake for a day to Magua (not to be confused with Gua, another long day's march to the north-west). At Magua we came upon some river gravels which yielded a few artefacts of Middle Kafuan age (=Middle Pleistocene). These have since proved to be almost the only direct evidence of age for the dating of any point in the sequence of events within the Rukwa basin. They are therefore of great importance, for they may enable that sequence to be correlated with those already made out in other parts of East Africa.

From Magua we followed the track to Gua for a short distance and then, much against the will of the men, struck off through the forest to camp under the northern slopes of Iloma Mountain. From this day onwards we became as it were "forest-conscious," for, with the rare exceptions of a small swamp or river-bed, we walked continuously beneath a pall of branches that shut us off from any view of the surrounding country. The forest itself was neither dense nor tall, the trees averaging only about a foot in diameter, yet 30 feet overhead their interlacing branches effectively prevented any view of the surrounding topography. During the following weeks this nuisance became a source of irritation that was hard to bear.

On leaving our camp at Iloma our way led steadily north-west till we reached another large river once more called the Kikamba, though we knew

Mbeya Mountain from the south-west

250-foot fault-scarp east of Rukwa

Chala Mountain from Ufipa plateau

Kwimba Mountain

The Usangu escarpment near Mbeya

Warungwa fish-traps, Ndidu pool, Rungwa river

it to be the Lukwati in its upper reaches. After crossing it we realized that something was wrong with our map, for according to our men the river flowed south of Mkunda Hill instead of north. It therefore appears that either the name of the hill is wrong on the map, or duplicated, or that the Lukwati flows south of it and joins a third stream called Kikamba and marked on the map as coming from a small lake near the escarpment. This last suggestion agrees with the fact that we later crossed a stream called the Some, which, again according to the map, is the name of a still lower section of the Lukwati-Kikamba river. A solution to the problem would be that the Some is a river flowing south of Kungwa and north of Mkunda, while the Lukwati-Kikamba flows south of Mkunda and Golwa to join the small river also called Kikamba. Unfortunately we were compelled to forgo our visit to Manda, whence Wallace crossed the dried-up lake-bed to Ukia, as we heard that it was impossible to travel north along the foot of the escarpment on account of the rise of the lake. Had we been able to do so, it would doubtless have been possible to straighten out this confusion of the rivers.

From the crossing of the Lukwati-Kikamba we turned more to the north, and four hours later, after a laborious walk through forest and bush heavily infected with tsetse fly, reached the Gua river, where we rested for two days. At Gua we found a large concentration of over three thousand natives with widespread cultivation and a White Fathers' Mission station. There we learnt that north of Gua there were no occupied villages and that it would be impossible to obtain any food by the way for at least a week. As our chief object was to reach the north-east corner of the lake, where the topography shown on the old German map led us to expect lake deposits, it was imperative that we should push on beyond Gua. But in order to carry food for our whole party for the necessary time our numbers would have become cumbersome as well as expensive. Dr. and Mrs. MacInnes therefore decided to turn back, travelling to Marambang'ombe by a different route.

On leaving Gua with thirty men my way led through undulating forest country where all the rocks were obscured by a blanket of laterite. Here and there stood isolated conical or ridge-like hills 1000–1500 feet high, while away to the east it was occasionally possible to catch glimpses of a heavily wooded and much dissected escarpment which apparently bounded a high plateau. At a number of rivers, as for instance the Wuku, we were held up because of the volume of water, but ultimately we always found a way over, either by means of a ford or across a fallen tree trunk jammed in the river.

After three days of rather slow progress on account of the rain, we camped just east of Tiwili (Nkakoni) of the old German map. There is now no village, nor are there any inhabitants in the country through which we were passing, and it was therefore difficult to get information about the surrounding topographical features. About 2 miles from our camp on the western slopes of Utumbura Hill we came upon a broad and swiftly flowing river called by our guide the Yeye. He told me that lower down it passed the site of Tiwili village, but that now there was no path over the escarpment. That the scarp was very near we could tell by the roar of the waterfall, and I made some effort to reach the edge, but the vegetation was so dense that it was out

of the question unless we were to camp there for the night. The Yeye certainly deserves to appear on the map, for it was the first river large enough to hold us up at all seriously, though where we finally forded it it was only chest deep and 25 yards across, but very swift.

From the Yeye northward we walked over a flat shelf bounded on the west by the Rukwa trough and dominated on the east by a number of isolated hills. The ground was swampy and sodden, which seems to indicate that the surface is very gently inclined away from the fault scarp on the west. Here there was no lateritic blanket, bare whale-backs of Basement schists or granite standing up through the humus for a few feet. So wet was it that in the evening we were glad to pitch our camp on one of these all too infrequent islands.

In these marshes we saw little game except roan antelope and elephant. There must have been many hundreds of the latter, for during the previous two days we had marched through country laid waste by them; trees had been torn up and thrown about, and great areas of grass and bush stamped flat amongst the shambles of the surrounding vegetation. Apart from the possibility of suddenly running into a herd we were most troubled by their tracks through the marshy ground. There, as always, they had followed the easiest route, leaving the ground pitted with holes, so that in some places it was impossible for the men to avoid these water-filled tracks, and they were compelled to make their way carefully along the crumbling ridges between the giant footprints. As one would expect in such a country, we were also troubled by mosquitoes. Even at midday every one's back was a clustered mass of them, and though we gradually became resigned to their presence, one or two of the men had badly swollen faces and others poisoned limbs through incessant scratching. As we were travelling at the end of the rainy season it may be that these bogs dry up to some extent later in the year, but a certain degree of permanence is shown by the frequent occurrence of the freshwater shell *Pila ovata* in the water-filled footprints of the elephants.

On April 22 we reached the Sara district, where we had hoped to find the lake beds cut into by the Rungwa river, but ever since leaving the Yeye we had travelled over perfectly level ground, whereas according to the map we should have descended the Rukwa escarpment somewhere between Kirasa's and Kasansa's. I found that the reason was that the scarp continued its normal north-west direction instead of suddenly running due north as shown on the map. This was unfortunate, because it meant that the expected lake beds could not occur near Sara and if I wished to find them it would be necessary to continue the journey to Rungwa (Ndula's). That we had been right in our expectations was shown some months later when we reached Rungwa from the west, but in April I decided against continuing beyond Sara as the rise of the lake would have meant walking for two or three days through water up to our waists, and at the same time risking a shortage of food. As I intended to stay a night or two at Sara we made camp on a rocky ledge of a small hill called Songwe by the guide, and some 150 feet above the marshes. There we hoped to escape the mosquitoes, as indeed we did the first night; but after that the wind must have changed, for relief was at an end.

When the bush on the top of the hill had been cut and the long grass burnt, I was able to see the surrounding country. To the south-west and west lay Lake Rukwa, bounded on the far side by the 3000-foot Ufipa escarpment, and even at that distance of some 40 miles or more we could see the white lines of waterfalls leaping down its rocky face. To the north of the lake were many miles of swampy country where grass and reeds grew in wide expanses of water. Between those swamps and the hill on which I stood lay the escarpment, running away towards Rungwa in the north-west, its edge picked out by a number of small rocky hills. Due north of our camp I could see the dome-shaped mass of Sara Hill itself, completely covered with bush. Though the name Sara appears on Dr. Kaiser's map of 1883, it now refers rather to the district than to any particular hill.

On leaving Sara a day or two later we followed the same route as far as Gua, but thereafter kept farther to the east, thus crossing the Lukwati-Kikamba much higher up than before, and rejoining our old route for the second time near Magua. From Magua we kept well away from the lake to the east of Kwimba, the Holy Mountain of the Wawungu. In spite of mission influence Kwimba is regarded by them with considerable reverence, and it is wise to obtain permission from the chief before attempting to climb it. As Dr. Grantham had already visited the mountain and found it to be composed chiefly of a coarse conglomerate which he assigns to the Bukoba System, we passed it by, and a day or two later I rejoined Dr. and Mrs. MacInnes at Marambang'ombe.

On May 6 we started on our return journey to Mbeya, but decided to stop a day or two on the way at 8000 feet near the top of the Usangu escarpment. That night the cold was intense compared with what we had been used to, and we were glad in the morning to take our breakfast wrapped in blankets. At that altitude the surrounding country was rolling grassland deeply cut up by numerous small rivers and streams. In their valleys the forest still flourishes, and some attempt is now being made to plant trees on the more sheltered slopes. From the higher points the distant views were magnificent, and in the early morning the strong scent of the bracken in the cold air made it seem like some part of the Lake District or Scotland. To the south-east the high country is bounded by the Usangu escarpment, a fault fracture running away for nearly 300 miles to the north-east. Undoubtedly it is connected with the rift valley tectonics, but as there is no opposing scarp the Ruaha valley at its foot cannot be counted a rift valley proper, though having the superficial appearance of one.

The next part of our programme was a short visit to the northern part of the Nyasa valley, as we wished to see for ourselves something of the Quaternary deposits of that lake, and also the volcanic range which fills the Rukwa–Nyasa rift where it is intersected by the fractures of the Ruaha valley.

Mbeya town itself stands on trachytic and basaltic rocks that spread round the Archaean rocks which form the Mbeya horst. To the east of the town a distinct line of cinder cones can be seen running up on to the northern flank of the Ngosi volcanic massif, really the western part of the Porotos Mountains. The present motor road passes close to these cones, and at one point runs across the lip of a sunken crater. Twenty miles from Mbeya a branch

road turns off to Tukuyu on the Nyasa side of the range. Following it one passes through bamboo forest at about 6500 feet, but the greater part of the country is either open grassland or cultivated by the natives. On account of the heavy rainfall there is a fairly dense population, and it is interesting to see the chequered patches of cultivation not only rising to the summits of the ash cones, but often running down into the craters themselves. The fresh green squares of young crops contrast strongly with the dark-brown of those ready for harvest or with the fresh-hoed earth, giving a quilted appearance to the whole unusual countryside.

In a number of the mountain streams the Mbeya Trout Association, and others, have introduced rainbow or brown trout, and the latter can now be caught up to more than 5 lb. in weight. Through the kindness of the Association we were able to use their permanent fishing camp during our stay in the mountains. There at Marupindi's, near the headwaters of the Kawira, we were under the northern slopes of Rungwe volcano, which rises to over 10,000 feet. To the west of our camp lay the Ngosi mass with its large Wenzel-Heckmann crater lake. To reach the lake one leaves the grassland, passing abruptly into the forest belt, where large trees gradually give way to bamboo as one climbs upwards. The side of the mountain s very heavily vegetated, but at the same time, on account of the softness of the volcanic material, it has been cut up into very steep-sided gullies through which it is extremely difficult to find one's way. Though usually in deep shade, we came occasionally to marshy patches where the sun filtered through and wild bananas grew among a profusion of balsams. When at last we approached the top, trees again mingled with the bamboo and lianas trailed from the upper branches, while giant begonias clambered more than 20 feet into the lower vegetation.

Arriving suddenly on the crater rim it is a shock to find how sudden and precipitous is the drop into the interior. Below lie the still waters of a mile-long lake, whose surface is ruffled only by occasional gusts that swirl down from above. A strange quietness brooded over the scene and was broken only by the distant call of a monkey or some water bird crying far down below. The screes of the crater walls fall so sheer into the water that apparently it would be impossible to pass round its shores, even if the descent were safely accomplished at one of the few possible places. From what we saw of Ngosi, and later Rungwe, together with the country lying between them, it seemed that the last eruptions can have occurred only a very short time ago. To some extent the fresh appearance is masked by the amount of vegetation, but heavy and almost continual rainfall on these mountains would quickly induce such growth. My own impression was that the date of the last volcanic activity in the region is to be measured in hundreds of years rather than by geological time.

After our visit to this volcanic region we had all intended to go down to the north-west of Lake Nyasa, but MacInnes had developed a poisoned leg, so that besides being hardly able to walk he was generally unwell and had to be left within reach of a doctor. Accordingly I went alone by lorry to Tukuyu and on to Ipiana in the Konde country. At that time with the rains still in progress the road was very difficult, and it was with some relief that I arrived

at the old deserted mission station after crossing the alluvial flats from the foot of the volcanic hills. Ipiana I found to be a pleasant place with avenues of tall palms and a profusion of citrons, lemons, and guavas growing wild in the forest, which has now encroached on the mission grounds. Like the old buildings my camp was on the very bank of the now broad Kawira river over which I was to cross in a dugout the next day.

Early in the morning the Wanyakusa porters sent by Chief Mwangamilo arrived, and as soon as we had got our loads over the river we began our march through extensive banana plantations and numerous villages towards the Nyasa border. In less than an hour we were at the Songwe river, the boundary between Tanganyika and Nyasaland. There we found only one extremely leaky dugout that could take no more than four men and their loads without sinking, and this delayed us for some time. A very little way farther on our difficulties really began, for the whole countryside was under water and we walked ankle deep for three hours without a break. At first there were ricefields, but later open grass and marsh where sometimes the water reached to our chins. Occasionally where it was very deep the tall men carried the shorter over on their shoulders, while those of us who could swim had to beware of the submerged thorn scrub, in which it was most unpleasant to get entangled. I have since found that this wide flooded area was mentioned by Stewart in 1879 as the "Great Elephant Marsh." The vegetation was peculiar; the grass appeared to be of normal subaerial type, while below the surface were moss-like plants that seemed to grow only under water. There were also lilies standing in the knee-deep water, and one which was flowering had long pendulous pink flowers. That there were fish in all this expanse of water was shown by the black-and-white kingfishers which persistently flew ahead of us to catch those we frightened into the open. About 5 p.m., after a final immersion, we climbed up on to the bouldery foothills of the Ijembe Hills. There just below the forest we found a well-swept clearing before a whitewashed school. In charge were two native teachers who went out of their way to help me during our stay in their village. Fortunately they spoke English, as I found that Kiswahili was of no use to me in Nyasaland, even so short a distance from the boundary.

The Ijembe Hills themselves are composed of schists of the Basement Complex against which are banked some of the later beaches of Lake Nyasa. By crossing the hills to Kasanta village and continuing westward towards Kianosi Hill we came into an area of Karroo rocks in which is a seam of coal about 20 feet thick. It was apparent from the cairns built at a number of points near the coal outcrop that the exposure had already been surveyed. As the quality of the coal appeared to be good, it is doubtless because of transport problems that it remains unworked. I was surprised that the local people at least had not learnt to use it, especially as it was they who brought it to my notice by reporting the existence of subterranean fires which had only recently been extinguished. Curious as to the origin of the story I walked over to the place and found this extensive exposure of coal flanking the whole side of the valley. Sparsely overgrown with grass and bushes, it had at some time been swept by a bush-fire which ignited the coal at a number of points. Once started it had continued to burn and smoulder for a while until extinguished

by heavy rain. Now small ashy craters mark the points where the flames of some unknown horror had threatened to break out upon the local inhabitants.

While at Ijembe I was able to visit Waumalambo village to the south. On the way I saw some low gravel-capped hills which according to Dr. Dixey are of Miocene age. These hills are formed of his Sungwa beds and consist of sands interbedded with coarse gravels. On the surface lies a thin layer of rounded stones which appear to be derived from the gravel lenses in the sands. The most striking thing was the number of humanly worked pebbles. The technique used showed that the work was done by man, but a careful search of the gravels *in situ* failed to yield a single worked stone, and it appears that those responsible for the culture were making use of the gravels subsequent to their deposition.

On our return to Ipiana we attempted to follow a better route, but in the end we had to cross the Great Marsh just as before. Back at Ipiana I determined to visit Nyasa lake itself before returning to Mbeya. I therefore went down to a point on the shore just north of the Kawira river mouth, on the way passing through continuous banana plantations and innumerable villages. Every one seemed to own a few cows, most of them standing about in the village street. They were not tethered in any way, and yet did not wander, but I noticed that every little group of cows was standing in the smoke of a small smudge fire of banana stems, leaves, and other refuse to keep off the otherwise troublesome insects.

The last half a mile to the lake was in curious contrast with the marshy country through which we had passed from Ipiana: a dry sandy expanse with some coarse spiny grass across which we walked to the actual shore. There I took a dugout and went out on to the lake. The shores were sandy and the water crystal clear with a sandy bottom, but as the lake has risen so much (about 12 feet) in recent years we could see bushes and other vegetation deep down beneath our canoe. Along the present shore the lapping of the water washes the sand from the roots of the tall grasses, which fall and are pushed back by the waves as a huge rolled bundle of matted vegetation something like a gigantic rolled-up sun-blind. In the bright sun the sandy beaches sparkled with the flakes of mica, while on their smooth surfaces there are strand-lines of coarse pumice pebbles, presumably brought down by the rivers from the volcanic region of Konde and Rungwe. As we paddled our erratic course southwards, past the mouth of the Kawira river, we were continually jumping in and out of the dugout to push it over the mud-banks. At one point we met a fleet of fishing canoes, and I learnt that they were all constructed from trees cut on the lower slopes of the Livingstone Mountains, which we could see in the distance rising 7000 feet above the lake on the far side of the water.

After my visit to Lake Nyasa I returned to our camp on the upper Kawira river, where I found that Dr. MacInnes had gone back to Mbeya on account of his poisoned leg. I therefore closed the camp and followed by the other route, over the Igali pass on the west side of the Ngosi mass. At first the road climbs steeply over Karroo rocks which in the upper part are capped by volcanics. From the top of the pass there is a magnificent view to north and south which emphasizes the continuity of the Nyasa–Rukwa rift valley.

Shortly after my return to Mbeya we were joined by Mr. Champion and Mr. Gillman, who were to accompany us during the next part of our travels. Our plan was to reach the Ufipa plateau *via* Abercorn in Northern Rhodesia, because the bridge that had been built over the Momba (Saisi) river the previous year had been carried away during the rains. As we found out later, it would in any case have been impossible to ascend to the plateau by that route because the track could only be used by cars going down. Even then the only one which had ever used the road had had heavy logs tied on behind to assist the brakes.

Before setting off on our detour through Northern Rhodesia Dr. and Mrs. MacInnes, Champion, and I paid a short visit to Ivuna Salt Pan about 12 miles from the south-west shores of Lake Rukwa. From Mbeya we travelled west to cross the Songwe river and then north over the Unyika plateau to Itaka. Thence we continued to Pocheramaka and left the valleys for the flats beyond Msongo and Fungwa, where the tilt-block of Basement Complex rocks plunges beneath the Quaternary deposits. During the descent from the plateau we passed first through low forest and then into more open country, till we came to almost pure grassland only relieved by an occasional baobab tree. The grass was 3–5 feet high, but fires had already burnt large areas, and later in the year the country is entirely swept by them, leaving open but blackened plains.

On arrival at Ivuna we found that the lake was a small one, perhaps a quarter of a mile in diameter, and sunk some 25 feet below the general surface of the land. It has now been divided up into a number of artificial pools by earth dams, because there are numerous springs in various parts of the lake, of which some are saline, some fresh, and others have up to $11\frac{1}{2}$ per cent. Glauber's salt (sodium sulphate). Though some progress has been made with the isolation of the various springs it has not yet been possible to locate accurately those which carry the salt. Until recently evaporation was carried out entirely by the sun, but now wood fires are used under huge iron trays, and the rate of production has risen very rapidly. Much of the salt is sold to local natives, and also to others who come from a distance. Many of them pay for it with grain, which is used to feed the men working in the salt pan, and there is also a considerable trade with the Lupa goldfield.

While walking round the shores of Ivuna I was delighted to find a few pieces of fossil bone, the first which we had found anywhere. Subsequent searching yielded a lot of fragmentary material, but apart from one or two *Hipparion* teeth there were no extinct species. As later events showed, these were to be the only mammalian remains found ***in situ*** during the whole expedition, a sad disappointment to us all.

During the few days which we spent at Ivuna we paid visits to the lake shore and to the Momba river at two points. The lake we found even more marshy than it was on the east side. There was no determinate shore-line, just a marsh of lake cabbage among swamped grasses and bushes. Since it was quite apparent from the level, unbroken appearance of the country near the lake that we should find no exposures at all, we turned our attention to the country west of Ivuna. There the Momba river flows almost due north and south for a considerable distance before turning eastwards towards the

lake. We first reached the river at Msamba, where we found it flowing in a wide sandy bed flanked in places by cliffs up to 40 feet high. These cliffs were formed of lake silts which proved quite unfossiliferous in both their upper and lower parts, the division being marked by a fairly distinct erosion surface.

Looking at the drainage on the west side of Rukwa it is noticeable that the larger rivers running into the permanent portion of the lake, the Momba, Niamba, and Songwe, all turn abruptly from their north or north-westerly courses to run due east. It may be that their direction was originally controlled by the strike of the underlying schists, or that they were deflected to the east at the time of the formation of the eastern scarp of the Rukwa rift. Our second visit to the Momba river was at the St. Bonifaz Mission, where it flows in a steep-sided gorge cut into old lake beds, which again appeared to be of two periods divided by an erosion surface. The beds themselves undulate gently, the axes being roughly N.W.–S.E. There as at Msamba we found no fossils in the deposits. Feeling that so far as the Ivuna area was concerned we had shot our palaeontological bolt, we returned to camp.

After leaving Ivuna we rejoined Mr. Gillman and set off on the road to Abercorn. Before reaching the Rhodesian border we climbed up a steep escarpment which may be regarded as the southern extension of the Ufipa fracture. Thus the Unyika plateau between it and the Songwe scarp must be regarded as a block of country lying within the rift zone. After passing the Mwenzo Mission on the Rhodesian side of the border, an undulating expanse of forest country stretched ahead of us. This great flat area is the watershed between the Rukwa basin and Bangweulu, or ultimately Moero as well, for the south-flowing Chambesi river becomes the Luapala in its lower reaches. The headwaters of the Chambesi and the Saisi, which flows into Rukwa, are very sluggish and choked with weed, showing that there is little fall in either direction.

On arriving at Abercorn we were able to pay a visit to the Kalambo falls, where the river drops 705 feet in a single step. The journey to the falls led us up and down a series of escarpments and slopes, which together with the fall itself brought home the disturbed nature of the country; and it was clear that in dealing with the east side of the Ufipa plateau we should have to remember that its western flank was also determined by tectonic features.

Leaving Abercorn for Sumbawanga we travelled east and north-east till after some 17 miles we crossed the border once more into Tanganyika. Soon we were travelling over a wide grassy plateau dotted everywhere with large termite nests. All of them appeared to be old ones, for they were heavily overgrown with grass and showed no signs of recent construction. Champion suggested that the nests may be evidence that the plateau was not long ago a forest area, as the distribution of these mounds corresponds to that of the larger trees in the remaining patches of forest. After destruction by fire the roots and the lower portion of the bole remain present for some time, providing food and a home for the termite. Similar conditions, he says, may be observed in Kenya at like altitudes, in areas known to have been under forest within the memory of man.

As we descended into the broad valley of the Mtembwa river we saw the

Mfipa man

Nyasa chief

Nyika woman

Wafipa mosquito refuge

Wafipa smelting-tower

Wafipa brewing beer

first evidence of recent rejuvenation of the region. The escarpment which flanks the valley on the south-west has a terrace running along its foot at a more or less constant level. Again on the far side of the valley, though not so constant, the same structure appeared. The terrace proved to be composed of old valley-filling detritus capped with laterite. Since the laterite of this part of Tanganyika is supposed to be of Miocene age, it means that in late or post-Miocene times earth movement affected the Ufipa area so as to cause renewed downcutting of rivers which had then very nearly reached their base level. That the Mtembwa is not the only valley affected in this way we saw during the continuation of our journey; for instance an exactly similar example is to be found in the Luichi valley near Sumbawanga. As we proceeded over the plateau many old mature valley forms bore witness to the existence of a previous drainage system to north and south of what is now the highest part of Ufipa. Many of the tributary valleys of this old system are occupied by rejuvenated streams that flow to east or west. In particular to the north-west of Sumbawanga our road led across large numbers of streams flowing to the east, and always as we approached these valleys the lateritic surface, on which one normally travelled, dipped down towards the river and was then truncated by the ground surface. From the present position of the rivers it seems that they have deepened their valleys by as much as 100–200 feet since the time of the formation of the laterite (? Miocene).

At a few places where there were extremely good exposures of massive laterite we saw that the Wafipa had built tall towers open at the top and having a number of small arched holes round their bases. These we learnt were the iron-smelting towers of the last generation and before, for so far as we could discover none of them is in use to-day, because iron can now be bought from Indian and other traders. These towers are mentioned by Cross in 1891, who remarked that they might be as much as 9 feet high and 5 feet in diameter at the base, holding about half a ton of ore. Wallace also saw them in 1897, and remarks that they are built of material from termite nests. Associated with the towers we always found large numbers of fused earthenware pipes which seemed to have been used to lead the air into the centre of the mass of charcoal and ore. The source of the ore was the laterite, hence the association of the towers with laterite outcrops.

From Sumbawanga we travelled north over the plateau through Chala and Namanyere to Milumba on the floor of the rift. At Kasangwa we crossed the watershed between the headwaters of the Muse and the Mfuisi (Msadia), both strike streams and, on account of the transverse direction of the Ufipa fracture, both flowing into Lake Rukwa. At Katete we were on the edge of the escarpment directly above Milumba, but here its altitude is very much reduced, the descent being no more than 1000 feet. The road winds steeply down, affording occasional glimpses over the extensive plains to the north of Rukwa, but the lake itself is not visible. At one point near the top a tremendous steep-sided valley was visible to the south-east. This was the Mtosi valley, which here at any rate must be of tectonic origin.

At Milumba we were once again on superficial deposits that at one time formed the shores of a greater Lake Rukwa. To the north and east were extensive grass plains liable to flooding, which stretch as far as the eye can

see, and it is there that the watershed between the Rukwa basin and Lake Tanganyika lies. For there to be a water connection between the two lakes would mean a rise of considerably more than 600 feet in the level of Rukwa. Nevertheless it is scarcely surprising that early reports always stated that Rukwa overflowed into Tanganyika, because the rise of the Rukwa plains is so gradual, and the watershed so indeterminate and liable to general flooding during the rains, that any traveller attempting to pass would certainly gain the impression that the systems were interconnected.

From Milumba we moved south-east to Usevia, passing an unexpected exposure of Karroo rocks in the bed of the river Msadia at Tetema. As the Karroo was only about 10 feet below the surface it brought out the superficial nature of the later deposits in this part of the valley. Farther on between the Kampasa and Mbeda rivers the track led close to the foothills of the escarpment, which here form a spur due to the intersecting N.W.–S.E. and N.–S. fractures that control the outline of the Ufipa escarpment. At Old Mpimbue, north-east of Kapunda Hill, there is a warm spring associated with the fractures which may perhaps be regarded as slight evidence of comparatively recent movement of these fault planes. A few miles beyond Old Mpimbue lie Mamba village and mission right under the foot of the main escarpment, which here carries a prominent shelf standing some 160 feet above the flats. This shelf is composed of solid Basement Complex schists, and must be due either to comparatively recent faulting or to preservation of the escarpment foot beneath the waters of the lake until some quite recent date.

At Mamba we encountered for the first time that unpleasant plant the *pupu* bean. We had been somewhat surprised to find that the local inhabitants kept quite wide paths open through the grass between their villages, and here the reason for this unwonted energy was explained. Among all the tall grasses and bushes grew the *pupu*, a form of climbing bean of which the pod is covered with extremely fine short hairs like velvet. When the bean is ripe and the pod dried by the sun, the hairs blow away in the wind to settle on the leaves and stalks of the grasses. There they lie, an invisible menace to the passer-by; for if one or two only of these hairs fall upon one's skin, the irritation is agonizing. So bad was it that the people of the country refused to travel except along the cleared paths, and we ourselves took to carrying soap for the purpose of preventing the inflammation.

From our camp at Mamba we made journeys in a number of different directions, including one to the Kavuvu river to inspect the bridge there. Every year the bridge is washed away and has to be rebuilt, and if, as had been reported, it was ready, Mr. Gillman would be able to return to the coast *via* Tabora instead of having to go westward to catch the lake steamer on Tanganyika. At the bridge, which proved to be almost complete, we found the Kavuvu to be a fairly broad river flowing in a wide flood-valley some 30 feet below the flats on either side. The local people, whose chief is a woman, call themselves the Warungwa and say that they are a branch of the Wanyamwezi. A number of them had barbed fish spears of which we bought one or two, and they told us that, though they used to smelt the iron, they now make the spears from *jembes* (iron hoes) which they buy from traders.

When finally we left Mamba our party was split up, for Gillman continued on his way towards Tabora and the coast, Dr. and Mrs. MacInnes went to Ndula's on the Rungwa river, and Champion and I went on south along the foot of the escarpment with the intention of reaching the junction of the Karroo and the schists. Unfortunately we did not succeed in this as it proved to be much farther than we expected, but we got as far as Mpanda (Pande). Wherever possible along the way we visited the foot of the escarpment and climbed up on to it for some distance, studying the rocks and the faulting. Indeed, on this and at other times Champion was indefatigable, and did not spare himself the arduous 3000-foot climb to the top of the scarp whenever it was likely to assist in the modifications which he was making to the existing map.

When he and I returned to Mamba we decided to pack up what remained of our belongings and follow Dr. and Mrs. MacInnes to Ndula's, where we hoped to find large areas of lake deposits exposed by the cutting of the Rungwa river. This indeed is what we did find, but though it was pleasing to see that the deposits we had hoped to reach at the north-east corner of the lake in April really existed, they, like all others in this basin, proved almost barren. MacInnes had indeed found a number of fragmentary derived mammalian bones, and a few fossil fish *in situ*, but hunt as we would it was impossible to find the place from which the mammal bones were coming. These lake deposits lie banked against a fault scarp which is the direct continuation of the one I had seen running away to the north-west from Sara. The beds are composed of white shales and pale yellow sands having a very gentle dip towards the lake, and it seems that they represent the old delta deposits of the Rungwa river when the lake was at a much higher level.

Where the Rungwa river now comes over the escarpment the falls have formed a large pool called Ndidu by the natives, who fish there in large numbers. They chiefly use harpoons, or rather spears, for though attached to a line, the head of the instrument does not become detached from the haft. They have also an interesting implement for landing the bigger fish when speared. This consists of a large iron hook in the form of a gaff, though barbed, and very like the Washashi gaff of Lake Victoria. Its peculiarity lies in the detachable head, which may be loosened at will by the operator, thereby leaving the fish attached to the shaft by a short length of cord and making it more difficult, if not impossible, for a large fish to twist itself loose. They also make rock dams across the river in the shallow water where it flows out of the pool. Among the boulders innumerable basket-work traps are placed, and so numerous are they that it seems impossible that any fish can survive to stock the upper water. Another inhabitant of Ndidu was a large crocodile, which I was able to shoot—much to the delight of the local people, who said that it had taken a heavy toll of their goats. As this one crocodile was reported to have lived there for many years and there appeared to be no others in the river, it will be interesting to know if another takes its place in the future.

An interesting relic which I saw at Masato's (not Msato's of the German map) was an old door made from a longitudinal section of a large tree trunk and carved into an intricate design, said to represent some of the tribal

insignia of the local people. So far as it is known this door is the only example of such carving among these people, but they insist that it was their ancestors who did the work and not some visiting stranger, as one might otherwise have have expected. Unfortunately they seem to set no store by it to-day, and it lies in the local assembly hut, where it has been somewhat disfigured by the children.

On leaving Ndula's we returned by the same route to Sumbawanga, where we began immediately to prepare for two further journeys along the foot of the Ufipa escarpment. For this purpose we decided to divide our party into two: Dr. and Mrs. MacInnes going about 80 miles to the south by lorry, there to pick up porters and work along the Momba river to link up with the region which we had touched from Ivuna; the second party, consisting of Champion and myself, was to leave Sumbawanga with porters and, having descended the Ufipa escarpment once more, work along its foot to make contact with the MacInnes at their most northerly point.

After five days at Sumbawanga, Champion and I left as arranged, and stopped that night at Ngongo near the foot of the escarpment some 16 miles away. For the first hour or two our way led over grassy country cut up first by north- and then south-flowing streams, but all the time we rose gradually as we approached the edge of the plateau. At 7300 feet we began to pass through grassy glades scented with the sweet smell of many flowers. At 7500 feet we had reached the top and began to descend gradually, a preliminary to the great drop to come, but before going over the edge we halted for a meal and afterwards enjoyed the fine view over the northern end of Lake Rukwa. The north shore of the lake is very irregular, great bays and inlets stretching into the marshes round Ukia, so that it seemed that the water is now even higher than it is shown for 1901 on the old German map. After our rest we plunged over the edge and jolted our way down more than 4000 feet in 3 miles, a most precipitous path and one which drove our toe-nails into our boots, made the thigh muscles weary, and gave rise to temporary synovitis. The last 400 feet were the worst of all, the slope being at least 30°. Once down on the flat there remained but one or two miles to Ngongo village through tall grass covered with *pupu*.

The next morning I visited Mashieti and Kalembo villages and, as I hoped, found that the Vuma river was cutting deeply into the lake deposits, affording numerous sections. Here again we were disappointed, for no fossils were found in any of them. The next day, still hoping for fossils, I followed the river for some miles along its north bank until near Luanji the last exposures disappeared beneath the vegetation. There I came upon a number of men beating *malezi* (millet) with long wooden flails shaped rather like polo sticks. The beating was done rhythmically in time to a song. Later the chaff is winnowed by pouring the grain from basket to basket and allowing it to blow away in the wind. The millet is used for making flour, but its chief use seems to be for brewing native beer, for which purpose it is germinated on damp mats and then fermented, after boiling in great earthenware jars.

From Luanji I returned to Ngongo along the south side of the river, where it was still possible to see traces of the old German footpath marked on the map. Now it is quite impassable, being overgrown with bush and trees, while

the native path which has taken its place wanders far over the countryside, though ultimately arriving at the same point.

That afternoon we pressed on to Zimba, where stands the White Fathers' Mission built in 1903. There, on account of the prevalence of bilharzia, we began to chlorinate all the drinking water besides using permanganate in the washing water. We learnt from the mission that 90 per cent. of the local population were suffering from it. Here it seems appropriate to remark upon the general health of the Wafipa, for considering the apparent plenty amongst which they live their physical condition is remarkably poor. Not having a medical man with us we found it difficult to decide on particular symptoms, but we gained the impression that the people were generally debilitated and slothful, besides having weak chests and limbs. We also noticed a very large number of blind or semi-blind people, and at the time I estimated that one in twenty had some eye defect, being totally blind in one or both eyes, or well on the way to being so. This was as noticeable among twenty-year-olds as among the older people.

It seemed to us that the people were suffering from some deficiency, though what it was we were unable to make out, in view of their apparently plentiful supply of fresh and dried fish, vegetables (which they seldom eat), and grain, besides chickens, muscovy ducks, goats, sheep, and occasional cattle. The blindness may perhaps be due to eating raw cassava, as I believe has been found to be the cause in other parts of the world. The view that some diet deficiency is the cause of their generally poor condition is borne out by the MacInnes' observations on the plains near the Momba river, where food of all kinds is much more scarce, and where the people suffered badly from ulcers and other afflictions. Another point which may possibly have some bearing on this matter was our observation that very often the people living in or near a mission village were in a worse state than the rest of the population. Where mission influence is at all strong, the making and consumption of the local beer are forbidden. It seems possible that, as in the case of the natives of the Nauru Islands in the Pacific, who, when forbidden to make palm liquor, suffered from vitamin A deficiency, so these people may lose some essential which they gain chiefly from the beer.

From Zimba we had two uninteresting days marching through long grass over flat country till we reached Milepa, where Mr. A. P. G. Michelmore had his camp for several years while doing locust research work. We found his camp intact and made use of it for the day or two that we stayed there. I doubt if there is a better situation in the whole of the Rukwa basin. The camp stands alone among large baobab trees, 200 feet above the village, and looks out over the lake scarcely $1\frac{1}{2}$ miles away. A few yards away a rushing torrent supplies sufficient water for a small irrigation system which waters the garden he had grown there. Our next stop was at Sakalilo, where we were met by the Mweni (chief), who proved to be a woman. She was accompanied by her consort, a very large and fat Mfipa, but she herself had a pleasant face with refined features and hands, besides being clean, the greatest recommendation of all. We thought that she must be a descendant of the Bahima, a Hamitic people who swept down through Central Africa from the direction of Abyssinia. They successfully established themselves as a ruling class not

only by fighting, but by their superior intelligence, and by this latter means came to be looked up to by the local inhabitants. Still farther on at Sangansilo we saw for the first time a mosquito refuge. We had heard of these, but had not previously seen a proper one. It consisted of a thatched roof over a wooden platform carried on poles some 10 feet from the ground. Under this erection a fire is lighted at night, and the owners clamber up to be kippered by the smoke in the hope of escaping the insects.

Beyond Sangansilo we saw a great darkening of the sky ahead, showing that a grass fire was in progress. Soon the smoke became a black cloud between us and the sun, and we felt cooler as we lost the usual glare from our surroundings. Presently the air became filled with larger and larger falling flakes of grey and black, the remains of burnt grass carried high into the sky. Through this dark snowstorm we walked for more than an hour, the smell of burning getting stronger and stronger. While still a mile from the fire we could hear the fierce crackling as of musketry, and great columns of black smoke billowed into the sky, obscuring everything ahead. When we came within sight of the flames they were still on the other side of a gully, but on both sides of the track and sweeping rapidly towards us. As we stood looking an arm of flame swept through the trees and tall grass of the gully, outflanking us on the east. In no time the porters had turned and were running back along the track to a small burnt area which we had passed. Half an hour later the fire had gone, leaving us in a blackened countryside dotted with smouldering trees that sent up thin columns of smoke into the still air, for the wind had dropped mysteriously as the fire disappeared in the distance. For several days afterwards the fires raged over the country, and at night the ridges and valleys of the Ufipa escarpment were outlined in fire as the flames swept up to the plateau above. These yearly fires are lit by the natives to destroy the rank grass and produce fresh green shoots for their cattle to feed upon. Unfortunately they also destroy all the young trees and bushes, so that gradually the country is being denuded of forest and left a grassland where only the tallest and coarsest of the grasses can survive.

At Kapenta a runner we had sent to the MacInnes returned saying that they would be camping that night only 8 miles from where we were. I therefore took a guide and walked over to their camp, where I arrived, much to their surprise, only half an hour after they had settled in. I heard from them that palaeontologically their journey had been fruitless, but that they had gathered considerable information about the country and would be able to make numerous alterations to the existing map west of the Momba river.

The next day Champion and I began our long climb back on to the Ufipa plateau. To our surprise the porters went very steadily, climbing the 3100 feet in less than four hours. Once on top, a mile or two brought us to Kapoma village, where we spent the night before going on to Kwela lake. Kwela is a small sheet of water about $1\frac{1}{2}$ miles long by half a mile wide. It lies in an old mature valley floored with laterite, and has evidently been formed by the elevation of the northern part of the old valley. Though the mature form of the valley still remains to be seen, it appears to have been modified by subsequent N.–S. faulting, which was presumably associated with the earth movement that gave rise to the Ufipa scarp as a whole. The lake drains into

the Mkanga river, which we crossed at the foot of the escarpment near Sangansilo, and there is little doubt that the back-cutting of the river will soon drain the lake.

From Kwela we made our way westward to Mpui, and so to Sumbawanga, before starting on our return to Abercorn and Mbeya. That journey proved long and tedious on account of mechanical breakdown, and was of little geographical interest, except for a visit to the south end of Lake Tanganyika and later the climbing of Rungwe Mountain. There, at a height of 7000 feet, the nightly frosts of August stiffened our tents and whitened the whole country: a bracing change after the heat of the Rukwa valley.

THE CAMBRIDGE EXPEDITION TO WEST GREENLAND, 1938

H. I. DREVER

ON 30 July 1937 three hours of geological work carried out by T. T. Paterson and H. I. Drever on Ubekendt Island in Umanak Fjord (lat. 71°, long. 54°) proved fairly conclusively that a petrological survey of the island might yield important results. An intricate profusion of acid dykes was observed to cut basaltic lavas and there could be little doubt that the intrusive rocks not only belonged to the Tertiary Igneous Suite but were the first of their kind definitely to be established in West Greenland. Work on the Thulean (North Atlantic) Tertiary province in recent years, chiefly in the Inner Hebrides, Iceland, and East Greenland, had greatly augmented our knowledge of igneous rock formation and emplacement, and further information about the province might prove of considerable interest. Accordingly Drever on his return made immediate preparations for an expedition the following summer, the main object of which was a petrological survey of Ubekendt Island.

D. M. Carmichael was invited to act as organizer. Carmichael was of the opinion, after consultation with Professor F. C. Bartlett, that interesting and novel work on the psychology of culture contacts could be carried out among the native population of the Umanak district, and various provisional methods of investigating this special problem were devised. R. W. de F. Feachem was later invited to assist in high-altitude balloon work, photography, and to continue the botanical work begun on Mr. Wordie's expedition. As a trained archaeologist he could also investigate some former dwellings which had been noted and cursorily examined the previous summer. P. M. Game, Assistant Keeper of Minerals, British Museum, joined the expedition shortly before it left to assist in the petrological survey. As a mountaineer he would be additionally suitable, for once the research work had been completed satisfactorily members of the expedition were to attempt to climb some of the mountains in the high rugged country bordering Umanak Fjord.

With the help of the Grønlands Styrelse a motor boat was chartered from the trader of the outpost settlement Sarqaq in the Vaigat, and we were allowed to use as our base a house built by Rockwell Kent in Igdlorssuit, the settlement on Ubekendt Island.

E. G. Dymond and H. Carmichael, who were responsible for the cosmic ray research on Mr. Wordie's expedition, were both strongly in favour of Drever's suggestion that the expedition might fly pilot balloons on suitable occasions throughout the summer, and observe and measure the flights by theodolite. As events proved, this work in no way interfered with or curtailed the main purpose of the expedition.

What success the expedition achieved will, it is hoped, in part repay those who assisted it. Grants were received from the Royal Geographical Society, the Worts Fund, and the Trustees of the British Museum. Press copyright was arranged with the *Scotsman*. Many firms generously contributed stores and equipment; others allowed large concessions in their purchase. The expedition is particularly indebted to Sir J. Donald Pollock, Mr. J. M.

Wordie, Professor F. C. Bartlett, Professor C. E. Tilley, Sir James C. Irvine, Professor T. J. Jehu, Mr. Rockwell Kent, the late Director Daugaard-Jensen, Dr. Rosenkrantz, Dr. Porsild, Mr. and Mrs. Axel Skjold, Dr. Christiansen, Mr. Fritz Fencker, and Miss Dorothy Featherstonhaugh, of the Scott Polar Research Institute. Ian Hunter very kindly undertook the construction of a

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short-wave wireless receiver for our use in West Greenland. Finally the writer wishes to acknowledge his debt to the other members of the expedition for their contributions to this paper and in particular to Carmichael for his constructive criticism.

The expedition sailed from Copenhagen on M.S. *Disko* on 4 June 1938. On board were Dr. A. Rosenkrantz, who was leading a Danish Geological Expedition to the Nugssuaq Peninsula, Dr. Porsild, Professors Thalbitzer and Hammerich, and Dr. Schultz-Lorentzen. After an easy passage across the

Atlantic we rounded Cape Farewell and sighted the high alpine peaks round Julianehaab on the evening of the 14th. Next day we had to force a passage through loose ice, the only pack-ice encountered during the summer, and on the 16th reached Godthaab in wintry weather, snow falling heavily for much of the day. After calling at Sukkertoppen, Holsteinsborg, and Egedesminde the ship arrived at Godhavn on the 23rd. A coasting schooner, the *Fylla*, sailed next day with the Danish expedition and our own, and by way of Jakobshavn, Ritenbenk, and Qutdligssat reached Igdlorssuit on the 29th.

Rockwell Kent's house was beautifully clean when we arrived, and Skjold the trader had already appointed a Greenlandic woman as a housekeeper or *Kifak*. The whole settlement turned out for the occasion and carried our stores and equipment, which were easily accommodated within the house, partly in a loft above the living-room and partly in a cellar below. Rockwell Kent has described the house in his recent book 'Salamina.'

Physiographically, Ubekendt Island may be divided into three distinct areas: the northern half, the median valley, and the southern part. The topography of the median valley is due largely to recent glaciation. The landforms of the other two zones are the direct result of geological structure.

The northern half. The dip of the lavas here is fairly constant to the south-west at about 20°, and the country consists of steep scarp cliffs and gentler dip slopes. There are a few faults. One strike-fault passes about 1 mile west of Igdlorssuit and is roughly parallel to the coast-line. The drag effect of this fault has increased the dips locally to about 50°. The steep V-shaped valleys follow the strike of the lava-flows. There is a steep cliff on the east coast, and a slightly less steep one on the north-west.

The median valley. This is a mature U-shaped valley, which runs across the centre of the island from coast to coast. The valley has been occupied by a recent glacier; associated smaller glacial valleys enter it at grade. The outcrops in this region are covered with a considerable thickness of glacial drift and fluvio-glacial material. A section near the south of the stream called Tuperssuarta, on the west coast, shows about 50–100 feet of loose, relatively unsorted material overlying a solid bedrock.

The southern part. The chief feature of this area is the conical granite hill called Sarqata qaqa, 3770 feet above sea-level. On its south and east sides this hill is surrounded by a prominent ridge, whose crest is roughly level and about 2300 feet above sea-level. This ridge is formed from the resistant contact-altered rocks which surround the granite. It does not form such an obvious feature to the west of the granite. In this southern part of the island the dip of the older lavas has been altered locally by the intrusion of the granite boss. Thus, in the south-east corner of the island the dip is gentle and to the north-west. Closer to the granite and south-east of the summit of Sarqata qaqa the dip is to the south-west, but much more gentle than in the northern part of the island.

There is a strong evidence of recent considerable uplift, provided by an uplifted peneplain and juvenile drainage.

Fig. 1 shows the profile of the south part of the island, from a point about 9 miles due east. A well-marked level is clearly seen in front of Sarqata qaqa

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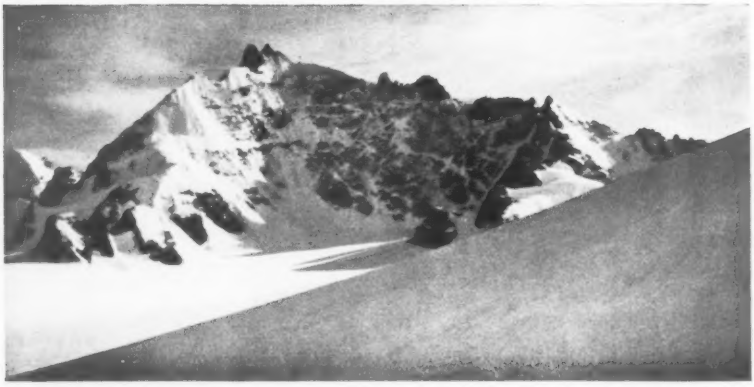


Typical mountain scenery round the snowfield of Upernivik Island

The snowfield in the centre of Upernivik Island

The eastern approach to the Upernivik snowfield

and at the top of the cliff which forms the east coast of the island. This level extends from Naqerdloq to the south and south-west. Near Naqerdloq the surface of this uplifted peneplain is about 400 feet above sea-level. Six or seven miles south by west of Naqerdloq it is 1000–1200 feet above sea-level. It is most probable that this was a gently sloping plain, which underwent uplift and, perhaps concurrently, slight tilting. The median valley itself, while sloping very gently to an almost imperceptible watershed, falls steeply as it approaches each coast, and actually ends in a cliff on both coasts. Erratics of Pre-Cambrian gneisses and schists are commonly found on Ubekendt Island at heights up to 3000 feet above sea-level.

The total lack of inlets or drowned estuaries and the prevalence of cliffs and straightness of the coast-line support the theory of uplift. The amount of such uplift cannot be stated with any certainty, but it cannot well be less than 400 or 500 feet. Faulting may also have contributed to the character and regularity of the coast-line.

Although the rocks of Ubekendt Island are mainly basic lavas we find here, in the southern half, an intrusive centre completely unlike anything previously discovered in the West Greenland Tertiary Igneous province. Occur-

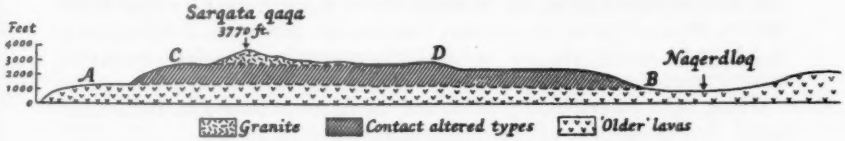


Fig. 1. Ubekendt Island

ring at the western extremity of the island is the severed remnant, about 3 miles in length, of a volcanic neck filled with an acid volcanic breccia. No volcanic necks have been noted before in West Greenland, and this one must have represented the pipe of a very large volcano. If we consider with these two facts the varied nature of rocks ranging from fine and coarse-grained basic types to porphyries and granites, the intricate dyke swarm, and the so far unique occurrence in West Greenland of massive Tertiary granite, we can regard Ubekendt Island as a particularly interesting geological locality. The relatively large masses of granite and of gabbro associated with the acid dyke and sheet swarm in the south probably represent the roots below a former caldera now removed by denudation. Judging from the number of eruptive centres in the British Tertiary province similar to this and the centre in the west, it is possible that further work will reveal new intrusive complexes on the mainland or on Disko.

Igdlorssuit is situated on the east coast of Ubekendt Island 5 miles south of Ingia, its northernmost tip. Built round the wide 2-mile sweep of a beach of dark olivine sand, the settlement faces north-east. Behind it mountains rise so steeply that "even the summer sun in transit stands as it were on tiptoe to peer over them," and for a longer period each day as the season advanced we looked out "from a darkened auditorium on to a lighted stage" [1]: to the

[1] Rockwell Kent, 'Salamina,' p. 169.

north the mass of Qeqertarssuaq; to the north-east the castle-like island of Karrat, and the fiords and mountains of Umiamako; and to the east, 10 miles distant across a strait filled with icebergs, the fine peaks and glaciers of Upernivik.

According to Feachem's archaeological evidence, it is probable that at some time in the seventeenth century Europeans were already coming to Ubekendt Island, where they encountered fairly modern native settlements. This corresponds to known facts about the northern European whalers and also indicates that there was no ancient occupation of the island. There was a spasmodic seasonal occupation of the district by Europeans for two hundred years, superimposed upon and mingled with a native culture mostly of the Disko Bay type, but with certain more northerly features.

The impact of white culture in North Greenland, where, unlike South Greenland, no sheep farming is possible, has not changed the essential nature of the natives' occupations. Some modifications in technique have, of course, occurred, following the introduction of firearms, nets, fishing tackle, and European materials generally; and the greater ease and safety with which a living can be made by fishing is now breaking down the old prejudice against that occupation and giving the fisherman almost as much social prestige as the hunter. In the Umanak district most Greenlanders contrive both to hunt and to fish, and it is they who are, and are likely to remain, the sole producers in this community.

Owing to its geographical position and the vigour of its people, Igdlorssuit is the most productive of the eight outposts which comprise the Umanak trading district. Its seal-hunting in summer, though adequate for the needs of the natives themselves, is not comparable to that of Satut or Nugatsiak, nor is there any opportunity for halibut fishing such as occurs in Ikerasak, and all the white fish caught are consumed within the settlement. Sharks however are taken in abundance in the tidal strait between Ubekendt and Upernivik islands, dried for dog food, and the liver sold to the local trader. White whales are netted in the autumn. Good ice forms fairly early—generally about the beginning of January—and from then until May it is relatively easy and profitable to hunt and to fish.

While no doubt the fine physique, intelligence, and initiative of the Igdlorssuit people are largely the result of a favourable environment, some credit at least must be given to Karl Nielsen, a trader who was in charge of the settlement until his death in 1919. He married a native woman and now all the more prosperous families claim kinship to him. Carmichael and Feachem made a genealogical table of his descendants to the third generation which is not only interesting in itself but indispensable to a study of the settlement.

As part of his study Carmichael made a sketch-map of Igdlorssuit showing, in addition to property owned by Danish administration, the frequency and distribution of native house types, the name, sex, and relationship of all the adult occupants of each house, the number of children (*i.e.* persons of either sex aged less than fourteen years) in each family, and the number of kayaks, boats, sledges, dogs, and shark-meat stands owned by each family. The frequency, compared with other outposts in the district, of substantial wood and turf houses of the so-called Danish-Greenlandic type and of houses of wood

only, which are the most expensive to build, is an indication of the prosperity of the settlement. Most of the houses stand on a pleasant grassy slope which provides natural drainage, and their grouping is determined mainly by a desire to avoid the dangerous rock-falls which may occur at any time during rainy weather in the summer. The economic importance of shark fishing is reflected not only directly in the prosperity resulting from the sale of shark liver but also in the number of boats [1] and dogs and shark-meat stands. The boats, either imported from Denmark or built by the natives themselves, are used chiefly for shark fishing, though to some extent they replace the umiaq as transport vessels on the now greatly curtailed summer hunting trips. Nearly every family owns or shares a shark-meat stand and can afford to feed a team of dogs. The importance of this to the community cannot be over-emphasized, for only those who have dogs and a sledge can hunt effectively in winter. It might thus well be argued that shark fishing is the basic occupation. The number of kayaks is not a true index of the number of hunters, for several hunters own two kayaks and some old hunters no longer use theirs. The one umiaq in the settlement was not launched during our stay there.

Birket-Smith [2] gives six as an average number of inhabitants per house in the Umanak district for the year 1923. This works out rather higher than the present state of affairs in Igdlorssuit—162 persons in 30 houses, some of which are double houses with a separate entrance and living-room for each family.

For the first half of July there were very few days in which outdoor work was out of the question and many were very fine, clear, and sunny. During this period, when the expedition was in Igdlorssuit, five successful balloon flights were made, the rate and direction of ascent being measured by an R.A.F. balloon theodolite stationed at the south-west end of an azimuth line between Igdlorssuit and the westerly headland of the island Qingussaq.

While Carmichael, assisted by the local catechist, invited numerous Greenlanders to the house for manual dexterity and assembly tests, the geologists, Game in particular, studied the magnificent section of olivine-rich vesicular lavas beside the settlement. Two preliminary traverses were made across the island, the coastal cliffs between Ingia and Naqerdloq were examined, and specimens collected chiefly from the large numbers of dykes. While Game stayed at Ingia, Drever, together with a Greenlander, walked from Naqerdloq to the highest point of the island, Sarqata qaqa, and rediscovered there a large intrusive mass of the granite indicated on Steenstrup's map and included in a generalized way in the later map of Lauge Koch as a "Zentraleruption."

Feachem stayed for two days in the *fangsthus* at Ingia and for two more days at Naqerdloq. In the latter locality he examined some fairly old dwellings, but found them unsatisfactory. In both places however he was able to collect flowers.

For travel by sea we relied on the small sprit-sail boat belonging to the trader and on a kayak lent to Drever by Miss Solveig Munck, the petrologist

[1] 'Greenland,' vol. II, p. 23. The total number of boats in the whole Umanak district in 1923 is given as twenty-one.

[2] *Ibid.*, p. 79.

of the Danish expedition. The boat made in all four trips to Ingia and one to Naqerdloq, and Drever, accompanied by a Greenlander, Johan Zeeb, twice travelled by kayak to Naqerdloq. On nearly all these journeys geological work could be carried out, and most of the east coast had been covered satisfactorily in the first fortnight. Drever had one small mishap when shooting at some passing guillemots from his kayak. Johan Zeeb, although about 20 yards away, effected a quick and competent rescue.

On July 19 three of the expedition set up camp at Sarqa on the southern coast of Ubekendt Island. The site is good if rather exposed. Water is easily obtained from streams or from pieces of ice thrown upon the shore, and we were close to some old dwellings of archaeological interest. The high cliffs of this coast afford some magnificent geological sections of a particularly interesting and often intricate character. In company with Johan, Drever first of all made reconnaissance journeys by kayak; by walking along and examining the screes it was also possible to trace the extent of the gabbro mass discovered on the Wordie expedition. Game in the meantime continued work on the dyke swarm, which here is complex, varied, and dense. Feachem worked for about a week on local archaeology and then returned to Igdlorssuit. The geologists remained until August 2. During their fortnight at Sarqa they made a fairly detailed examination of the area, and in spite of bad weather for six days they managed to map it satisfactorily. The work on these cliffs is strenuous. Johan Zeeb made an excellent ghillie who shot birds, chiefly burgomaster gulls, carried rocks, washed dishes, identified archaeological specimens, and safeguarded journeys by kayak. For his services he was paid at an approximate rate of three shillings per day.

On August 8 our own motor boat, in an efficient and clean condition, reached Igdlorssuit from Sarqaq, and on the 9th we were able to continue the coastal survey in a much quicker and better way. Carmichael was in charge of the motor boat. At the rate of about four shillings per day we employed a Greenland engineer, Knud Nielsen, who proved satisfactory in almost every way. There were two men in the settlement with experience of semi-Diesel engines, and on some occasions we employed Hendrik Quist as the other engineer, or both him and Knud. Johan Zeeb came with us occasionally as a deck hand.

When Dr. Christiansen had invited the expedition to her house in Umanak to meet the Danish expedition again, Drever decided that Carmichael and Feachem should go there while he and Game investigated Upernivik Island. If possible Feachem was to have an opportunity of collecting calcophile flowers in the ecologically interesting areas round Marmorbrud or Marmorilik, while Drever hoped to cross Upernivik Island and also examine the Tertiary rocks in the south-west corner. From an examination of the rocks around the coast of Upernivik Island and observations during the traverse across it, we would be fairly sure whether or not there were any Tertiary rocks other than those in the south-west. It was decided that Drever would attempt with Johan Zeeb to cross the island while Game worked in the area where Tertiary rocks were known to occur.

Johan Zeeb, when approached, did not like the idea of crossing Upernivik Island, and both he and Knud Nielsen believed there was a very steep ice-fall

The granite summit of Ubekendt Island, Sarqata qaqa

Preparing for a balloon flight at Igdlorssuit

Property of a successful hunter and fisherman

Carmichael supervising psychological research in Rockwell Kent's house

at the east end of the proposed route. We were fortunate in possessing the map made by the Danish Geodetic Society. As Johan and Knud affirmed that mountains descended abruptly into the fjord along the northern coast, we took two kayaks with us, one to be left on the west end of the traverse and the other at the east end, so that in the event of an accident, or should we find the route impossible, Johan could return for help or food to Igdlorssuit. A food dump was to be left with each kayak. We left at 12.5 a.m. on August 12 and were all back again in Igdlorssuit on the 16th with the programme completed.

Game was first of all landed with tent and equipment. The ratchet wheel of the starting gear broke as we were getting under way again, but after five hours' work with rather inadequate materials a temporary repair was effected and the journey continued. Although the northern part of the island falls in high steep cliffs to the sea Drever was sure, after examination from the boat, that one could walk or climb along the coast-line except at one place. The doubtful and difficult place was closely examined, and Drever decided it was practicable with the help of a rope, and that we could dispense with the second kayak. Drever and Johan were then landed and spent a very chilly night in a cave while snow fell heavily about 200 feet above them. They started at 7.30 next morning in clear, sunny weather with provisions for two days and a short ration for four, an ice-axe (there should have been two), a rope, crampons, ice-piton, camera, prismatic compass, aneroid, pocket sextant, primus, geological hammer, and a waterproof sheet under which to sleep. The traverse was completed by 11.45 in the evening. The map was found to be inaccurate: no serious difficulty was encountered, although at one or two places a rope and ice axes are essential. The rocks are all igneous gneisses. Johan returned by kayak to Igdlorssuit and arranged there for Drever to be taken back by sailing boat the same day.

Game, who was picked up by the motor boat on its return from Umanak, made some important geological discoveries, among which was that of a gabbro laccolite intruded into Cretaceous-Tertiary sediments.

Carmichael encountered no more trouble with the motor boat and his visit to Umanak had been satisfactory. Feachem on the other hand found, on reaching Marmorbrud, that the season was somewhat advanced for calcophile flowers.

After our return further geological work was carried out with the motor boat, the coastal dykes were mapped by timing, and the more important localities photographed. Finally, when only the west coast remained to be examined, three of the expedition were taken there, Game encamped at Erqua, Feachem at a point a few miles west of Sarqa, and Drever had a roving commission between the two camps. Carmichael, with a crew of two Greenlanders, then took the boat to Umanak, where he had work to do, and from there to Sarqaq to bring back two Greenlanders who could take the boat back to her owner. On Carmichael's return he picked up Feachem and Game, Drever having by that time walked back to Igdlorssuit. All members of the expedition were again at the base by the evening of the 28th. The work had now been almost completed in a satisfactory manner.

Both the geological and archaeological work and the flying of balloons were

made difficult or impossible by bad weather, the worst for about thirty years, throughout the summer. The flying of the balloons was a spare-time job in any case, and eventually only ten flights were made, two of which were hardly satisfactory. The results of eight of the flights however have served to confirm observations on Mr. Wordie's expedition the previous summer. The data which had been computed and plotted will shortly be ready for publication.

A collection of plants for the British Museum was made at Igdlorssuit, Ingia, and Naqerdloq on Ubekendt Island, at Nugatsiaq and Naujat on Qeqertarssuaq, and at Gamle Marmorbrud; 405 specimens were obtained.

Shortly after our return the *Disko* arrived at Marmorilik, and as our motor boat had been sent back to Sarqaq we had to wait in Igdlorssuit till news came through by wireless as to how we were to be conveyed to it. Carmichael had been instructed to make arrangements for a motor boat to come for us from Umanak, but finally we heard on the 7th that the schooner *Nordlyset* would pick us up in two days' time. Drever made an unsuccessful attempt with Johan Zeeb to climb a very fine peak over 7000 feet high. He was later picked up by the schooner and the expedition was taken to Marmorilik, where three of us joined the *Disko*. It had been arranged that Carmichael should remain behind to continue his psychological work in Umanak and return home by a later boat.

Although much has been written elsewhere on the subject of kayaking, it may be of interest to assess here a kayak's usefulness in geological surveying of coastal cliffs. One cannot, of course, either overemphasize the dangers of this method or the need for being accompanied by a native. The native can not only carry specimens but can also hunt and shoot birds. The method is a quick and economical one. In the case of Ubekendt Island it is often impossible to walk or climb very far along the shore because the cliffs fall steeply to the sea. A rowing-boat requires two men, one to look after it while the geologist collects specimens. Drever, on one occasion when alone, used a small pram while working along the south-east coast in good weather, but on a day when there was a slight swell coming from the south. An interesting dyke might be observed and the pram brought to the best or only landing-place from which the dyke was accessible. If it was found impossible to draw the pram up or moor it in any way, specimen collecting might consist, as it sometimes did, of a hectic race between successfully attaining a specimen and swamping the pram. A geologist can often, at least in West Greenland, efficiently carry out geological surveying by kayak, particularly where there are steep coastal cliffs, and at the same time with the help of a native live largely off the land. The cost of chartering the motor boat without additional expenses amounted to approximately £1 per day.

The "colony" or chief trading station of Umanak clusters round a small but well-sheltered natural harbour on the south-east corner of an oval island, 5 miles by 2, and is dominated by the magnificent notched peak from which it derives its name. Here Carmichael had an opportunity to observe life in Greenland in its most complex form, for in Umanak, as in all the chief administrative centres, there is a fourfold social grouping—Danish officials, "producers," and two types of "non-producers." The Danes number about fifteen. Of a native population of three hundred, about 60 per cent. claim to

be producers (hunters and fishers), but the actual proportion is probably less, for those who rank as sealers are entitled to a greater share in the so-called "repartition." The non-producers consist of: (1) Greenlanders in regular Government employment, such as catechists, clerks, store-keepers, accountants, wireless operators, and so on; (2) Greenlanders who earn a precarious hand-to-mouth existence as casual workers—as crews on board coastal schooners, as stevedores during "ship-time," and as day labourers generally. Most of these men can find employment only during the summer months, and the fact that they are increasing in number and have to be supported is one of Greenland's chief social and economic problems. Greenlanders in regular Government employment, on the other hand, lead a very secure existence, and at least partly as the result of the economic principle which has been adopted by the administration in trading with the natives and which, on the face of it, appears somewhat unfair and discouraging to the producer, they have attained an economic superiority which is manifest in their houses, clothes, and general mode of living.

Dr. Christiansen, whose guest Carmichael was, invited him to accompany her on her district rounds whenever he wished to do so, and by the time of his departure he had seen all the outposts in the district, except Niaqornat, on the north-west corner of Nugssuaq Peninsula. Edward Kruse, the chief catechist of Umanak, proved such an excellent interpreter and translator that no time was spent on psychological tests, but attention was concentrated on experiments on remembering and constructive thinking for which written material is required. All the experiments were conducted in Umanak, except on October 17, when Kruse found it possible to come to Quaersut. By 9 p.m. he and the local catechist had rounded up most of the inhabitants, and a very successful group experiment was carried out by candle-light in the outpost's tiny school. Kruse not only translated the necessary material into Greenlandic, but also undertook and completed the much bigger task of translating from Greenlandic into Danish the results of all the experiments in Igdlorssuit and in Umanak. As Dr. Christiansen was good enough to supervize all English-Danish and Danish-English translation it was possible to carry out accurate experimental work more quickly and extensively than in Igdlorssuit.

Carmichael was ill when the *Hans Egede* arrived on October 2, and he had to wait for the *Gertrud Rask*, due in Godhavn early in November. The voyage south to Godhavn was made on board the schooner *Sigrid*, calling at Marmorilik, Qutdligssat, Sarqaq, and Ritenbenk. At Qutdligssat, where the *Sigrid* lay for four days, Carmichael was the guest of Chief Engineer Gising, and at Godhavn of Governor-General Rosendahl. The *Gertrud Rask*, which had met with contrary winds all the way across the Atlantic and up the west coast of Greenland, arrived on November 20, the latest Danish trading ship ever to visit North Greenland. By this time the sun had set for the winter, and the navigation of the small unlighted harbours of Disko Bay was particularly difficult. Further obstacles were met with at Jakobshavn, where ice was forming so rapidly in the harbour that barges could not be towed through it by motor boat, and loading and unloading of cargo had to be carried out partly by dog-sledge. Finally the *Gertrud Rask*

left Egedesminde on November 28 bound for Copenhagen. After four hours' steaming the ship ran into new ice, the forerunner of a field of light but genuine west-ice through which she pushed her way slowly for eight hours. She had fair winds south to Cape Farewell, and across the Atlantic, passing Fair Isle on December 10. From December 11 onwards however she encountered heavy and continuous south-east gales, and remained hove-to, mostly on the starboard tack, for the greater part of a week, reaching Aalesund on December 18. Here Carmichael left her and proceeded home *via* Bergen.

APPENDIX: PSYCHOLOGY AND ETHNOLOGY

D. M. CARMICHAEL

Work was carried out from the beginning of July until September in the outpost of Igdlorssuit and from September until the end of October in Umanak, the administrative centre of the district. The investigations were mainly psychological, but some notes and collections of ethnological and anthropological interest were also made.

Psychology

The psychological investigations can be divided into a study of group-contacts, experiments in social psychology, and individual tests.

Group-contacts. In Cambridge an inquiry is at present being made into the psychological factors which promote or prevent friendly relationships between two or more social groups.[1] It is essential for this scheme of research that the contact of small groups, whose history, outstanding membership, and cultural background are well known, or can easily be determined, should be made the subject of direct observation. The Danish administration of Greenland furnishes an outstanding example of harmonious working relationships between Europeans and a native population which has undergone, and is still undergoing, significant changes in its social and economic organization. The opportunity was therefore taken this summer of studying this relationship at first hand with a view to discovering how far the harmony can be assigned to specifically psychological causes. Although a greatly extended period of observation is required to reach satisfactory conclusions, a preliminary report on the findings of last summer will be published in connection with the general scheme of research mentioned above.

The relationship between Europeans and Greenlanders was defined and examined, not only in order to determine its causes but also to note some of its effects. In dealing with the contact of two groups possessing different cultures, the anthropologist endeavours primarily to discover what elements of culture pass from one group to the other, and what changes these elements undergo after they have been imported by an alien group. The psychologist starts where the anthropologist leaves off, and asks how far this transference and modification of elements of culture can be explained in terms of the basic group-relationship, the social determinants common or peculiar to each group, and the attitude and influence of individuals. The adoption of this general line of approach suggested immediately that some attempt should be made to discover the attitude of individual Greenlanders to the changes which their culture has undergone and is still undergoing. Attention was confined to objects of material culture, and a

[1] "The cooperation of social groups," F. C. Bartlett. Occupational Psych. XII 30–42. D. M. Carmichael. *Brit. J. Psychol.* XXIX, 206/231.

semi-experimental method used. Greenlanders show a lively and intelligent interest in pictures. A series of pictures, showing objects of Eskimo culture from all parts of Greenland, and from the earliest times down to the present day, but arranged in no special order, was shown to a number of adult men. Each subject was asked the same set of specially selected questions concerning each picture, and notes on his general reactions were made. The results so obtained suggest that, using improved material, a wider survey of individual attitudes would not only be interesting but would probably also indicate some of the group factors which are of significance in determining the exchange and modifications of elements of culture.

Notes were made on sports, games, and pastimes in the Umanak district, special attention being paid to those which have recently been assimilated. A fairly successful attempt was made to introduce some new games into the settlement of Igdlorssuit. The manner of their acceptance was noted, and it should be interesting to see what ultimately happens to them.

Experiments in social psychology. Remembering—the "Method of serial reproduction"—was employed.[1] Briefly the aim of these experiments is to find out something about the social factors which determine the form which a rumour, or a story, or a decorative design finally assumes in a given social group. The material used in Greenland this summer consisted of specially selected stories translated into Greenlandic and picture material. In the case of the stories the following procedure was adopted. The original version of a story was read twice to subject A. After an interval of from three to five minutes, A was asked to retell the story to the experimenter, who wrote it down. A's version was then reproduced in similar manner by B, whose version was subsequently dealt with by C, and so on until the story assumed a new and stable form. In the case of picture material, each subject was given adequate time for observations, and then asked to make a pencil drawing of what he had seen.

The stories were used both in Igdlorssuit and in Umanak, reproductions of each being obtained from separate series of men, women, and children. The reproductions are now being analysed in order to determine the nature, and as far as possible the causes, of the modifications which occur. The picture-material was used in Igdlorssuit only, and there not very extensively. The method however was quite practicable with Greenlanders, and likely to be profitable.

Constructive thinking: it is contended by Levy-Bruhl and others that primitive people think differently from normal civilized persons, in the sense that their mental processes are essentially different. Primitive thinking is said to be "pre-logical, emotional, mystical, self-contradictory," this conclusion evidently being reached after comparing primitive man's manner of interpreting the universe with that of modern scientists and philosophers. All that has been shown however is that primitive man does not employ certain logical criteria of truth and falsity, and no real evidence is brought forward to prove that his thinking, as a mental process, is "psychologically different from that of the scientist and philosopher." These experiments are designed to show that, when normal civilized persons and relatively primitive people [2] are faced with a certain type of problem, they think in exactly the same way.

[1] *Cf.* F. C. Bartlett, 'Remembering.' Cambridge, 1932, pp. 118–185.

[2] Levy-Bruhl confines his statements to primitives untouched by European culture. Of the Greenlanders however Schultz-Lorentzen has written ('Greenland,' vol. II, p. 210): "The Eskimo mind has kept its peculiar *primitive* character unchanged. . . . It holds its ideas and groups of ideas as juxtaposed factors. It is unable to join them in a unity. . . . The Greenlander has no difficulty in keeping in his mind considerable contradictions and contrasts."

The experimental procedure is very simple. A number of problem situations are described, the issue of each generally turning on the actions of two or more persons or groups of persons. The situations are left incomplete, but a number of clues are given which indicate two or more possible solutions. The stories chosen were translated into Greenlandic and read to one hundred Greenlanders taken individually or in small groups. Each was asked to say what he or she thought would happen, and all the answers obtained were then analysed and classified.

The advantages of this method are that it is objective and does not demand introspection on the part of the subject (an essential requirement when dealing with primitive people); it is realistic, presenting practical social situations about which most people feel justified in expressing opinion, and which readily interest all types of subject; it eliminates the danger of becoming involved in irrelevant logical questions, for it uses situations of which no one of a number of possible solutions is necessarily "more right" than any other. Thus any two solutions may be diametrically opposed to one another and yet be the result of the same psychological type of thinking.

A preliminary analysis of the experiments in Greenland seems to justify the following three general conclusions:

(1) On being presented with a scattered set of data embodied in an incomplete situation, 70–100 per cent. of Greenlanders will settle the further issue in terms of a more or less uncritically accepted conventionalization. This conventionalization may appear as an explicitly formulated generalization [1] or its utilization can be inferred from the fact that within any one group most subjects seek a solution which runs along easy, stereotyped lines. (2) In reaching their conclusions Greenlanders constantly tend to pick out some one item or set of items to which they give a completely dominating weight. Only very exceptionally is any attempt made to utilize all the data presented, "to combine them in a unity" and so avoid "considerable contradictions and contrasts." (3) Frequently subjects went outside the data presented, and introduced new facts or principles. As this tendency may be due to the type of material used, control experiments, which demand solutions within the limits of the data presented, must be devised and carried out.

A similar series of experiments, using a parallel set of problem situations constructed to suit different social backgrounds has been carried out in Cambridge by Professor F. C. Bartlett, who invented this method of investigation. A comparison of results proved immediately that members of various social groups in England think about this type of problem situation in precisely the same way as Greenlanders do, and that the three general conclusions stated above apply equally well to Greenlanders and to Englishmen. In short, the mental processes involved are psychologically identical, and the contention that we civilized people strive always to reach a well-balanced, coherent conclusion, while the primitive is willing to abide incoherence and even "considerable contradiction and contrasts" is, if not unfair to the primitive, at least highly flattering to ourselves.

While, within any one social group, there is usually considerable agreement as to the probable upshot of a given situation, other social and racial groups may complete the same situation in an entirely different manner. This suggests

[1] The crop of generalizations obtained in this manner from Greenlanders forms a very interesting by-product of these experiments, especially when the generalizations are elicited by a situation which concerns the relationship of Greenlanders and Europeans.

that the processes of conventionalization, selection, and weighting from which these different conclusions result are themselves specially determined, and should be made the subject of further experimental investigation.

These experiments proved the most interesting and most productive part of the psychological work. A paper on them, and on the experiments in England, will be published in collaboration with Professor Bartlett.

Individual tests. Three types of tests were used in Igdlorssuit. In the eye-muscle tests for potential squint, of 65 subjects, of both sexes and aged from 8 to 54 years, 5 (7·7 per cent.) showed abnormality. In the sensori-motor tests, two tests for hand and eye cooordination were used: the "rings test" and the "matches test." The mean test score of 30 men (15–34 years old) with the rings was 74·0, and with the matches 54·7. By comparison the mean test score for 178 unskilled English workmen (average age 32) was 80·0 and 58·0.

In the assembly tests, of 30 men, aged from 15 to 54 years, 25 (83·3 per cent.) failed to complete the cube in the allotted 10 minutes. The average time of completion was 8 minutes 23 seconds, with a range of 6½–10 minutes. By comparison, of 915 R.A.F. and dockyard apprentices (average age 17) 40 per cent. failed to complete the cube in 10 minutes. The average time of passes was 6 minutes 40 seconds, with a range of 3–10 minutes.

In the mechanical ability test the mean test score of 30 men (aged 15–54) was 22·2. For comparison the mean test score of 770 dockyard apprentices (15–17 years) was 31·7. It was possible to use the tests only on a very limited scale, and these results have probably little statistical value. Nevertheless they suggest that the discrepancy between Greenlanders and Englishmen is least in tests of mere dexterity and muscular coordination, and greatest in those which demand both dexterity and constructive ability. This hypothesis might give direction to a further large-scale comparative series of tests.

Ethnology and anthropology

A map was made of the settlement of Igdlorssuit showing the distribution of house-types, the name, age, sex, and relationship of the occupants of each house, and the number of kayaks, boats, shark-meat stands, dogs, and sledges owned by each family. With the help of the hunter Knud Nielsen, a genealogical table of the descendants of the trader Karl Nielsen was drawn up. About one-third of the present population of Igdlorssuit are descendants of this trader, and the table is of considerable anthropological interest. Physical measurements and photographs of heads were also taken.

A collection of sixty string figures and a number of articles of ethnological interest was made in Igdlorssuit.

The services of an interpreter were necessary in Igdlorssuit and again in Umanak. I had the good fortune to find in Thue Nicolaisen a willing and apt "experimenter," while no praise is too high for the excellent translation work of Edward Kruse, the intelligent and enlightened catechist of Umanak. Udstedsbestyrer Skjold and Pastor Sverdrup-Nielsen gave invaluable assistance in English-Danish translation.

PEAKS OF THE ASSAM HIMALAYA

H. W. TILMAN

FROM the mountaineer's point of view nothing is known of the Himalaya east of Chomolhari, and not very much is known of the topography. For 180 miles the range forms the northern boundary of Bhutan, and for another 250 that of Assam; but it should be noted that though the Himalaya may be assumed to mark the Assam–Tibet frontier, the boundary has never been delimited. The whole range from the Tista valley in Sikkim to Namcha Barwa (25,545 feet) and beyond is called by Burrard and Hayden the Assam Himalaya; it would be less confusing to confine the name to the mountains lying north of Assam.

Where the range passes from Bhutan into Assam there is a wide breach formed by the upper eastern basin of the Manas, and immediately east of this gap is a group of high peaks which cover about 50 miles on an E.N.E. alignment. These I hoped to explore this year. The major peaks have been fixed trigonometrically from stations in the Assam valley. During their great exploration of the Tsangpo gorge in 1911 Bailey and Morshead travelled and surveyed along the Tibetan side of the range. In 1935 and 1938 Kingdon Ward skirted the western end and visited the valley of the Gorjo Chu, which, for reasons that will be apparent, is the only practicable approach to the range. In 1934 and 1936 Messrs. Sheriff and Ludlow covered much the same ground, but the peaks, passes, and glaciers of this region remain unvisited.

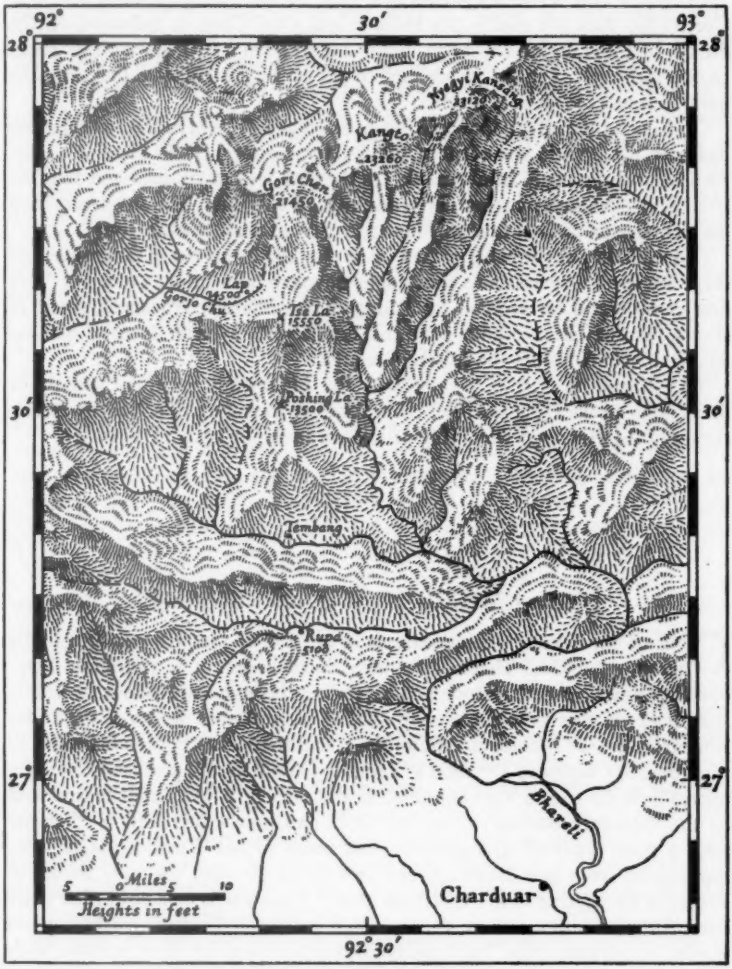
Two routes into Tibet traverse the gap formed by the eastern tributaries of the Manas. The more eastern route skirts the Assam Himalaya, crosses the Gorjo Chu valley, and passes within 10 miles of Gori Chen (21,450 feet), thus forming the obvious line of approach from the south. It would be simpler if an approach could be made from Tibet, where there are villages from which food could be got and where the effects of the monsoon would be less felt; but the good will of Lhasa for British mountaineering parties is given principally to Mount Everest expeditions.

On the south side of the range, except for the narrow strip of country between these two routes, the foothills of Assam are the home of savage tribes: Miji Akas, Silung Abors, and Daflas. Known as the Balipara Frontier Tract, this unadministered territory stretches east to the Subansiri and beyond. The eastern route to Tibet lies on the edge of this hostile country and it is not possible to leave the route until near the Himalaya, where the country becomes too high for these forest-dwelling savages. A Political Officer stationed at Charduar, some 20 miles north of the Brahmaputra, is in charge of the Frontier Tract.

With three Sherpas I left Charduar on April 11 and after four marches through uninhabited forest we reached the first Sherchokpa village of Rupa (5100 feet). On the 18th we arrived at Tembang, which is the last village of any consequence on the eastern route. Two of the Sherpas and I developed malaria here, so that it was not until April 30 that we continued the march with seventeen local coolies (Mönbas). We crossed the Poshing La (13,500

feet), the Tse La (15,550 feet), and camped in the valley of the Gorjo Chu at a shepherds' camp called Lap (14,500 feet) on May 3.

The local men were now dismissed, but our malaria, aggravated by the



The Assam Himalaya

height, attacked us afresh. Two of the Sherpas and I were really ill, but the third Sherpa, upon whom all the camp work was devolved, was less affected. Four plane-table stations were occupied and resections made in the vicinity of Lap; and one Sherpa and I occupied a camp higher up the valley. I still hoped that we should throw off our fever and be able to carry out our programme of

making a circuit of Gori Chen, climbing and mapping *en route*, and then visiting Kangto (23,260 feet) and Nyegyi Kansang (23,120 feet), the highest point of the group farther east and north.

I mapped a bit of the Gorjo Chu near Lap, but not enough to be of use. The Gorjo Chu does not rise in the basin round Gori Chen as indicated on the Survey of India degree sheet 83A, but is cut off from it by a snow ridge about 18,000 feet high. I made an attempt to get on to this ridge to look into the basin, but was too weak to reach it.

On May 24 we returned to the lower camp at Lap, where the two Sherpas had been left, to find one of them, Nukku, lying unconscious. He died on the 26th before help could be obtained. On the 28th we got six men and four *zos* from Mago, a hamlet farther north on the road to Tibet. The six men carried the sick Sherpa to Charduar on June 11, two months after setting out.

Our malaria was probably picked up at our first camp out of Charduar, but there are several precautions that might be taken on a future occasion. This first camp could be avoided by a long double march; trousers instead of shorts, bamber oil, mosquito nets, and heavier prophylactic doses of quinine would all help to reduce the risks of infection.

The strange mixture of peoples and the interesting group of twenty or thirty high peaks lying north of them combine to make this a most attractive corner of the Himalaya which I hope to have an opportunity of revisiting.

THE 1/MILLION MAP OF EUROPE

ONE of our Society's achievements in the war of 1914–18 was to compile about a hundred sheets of a provisional series of a 1/Million Map, covering practically all Europe and extending through Asia Minor to Arabia and 'Iraq. At that time there were only a few scattered sheets of the Carte Internationale du Monde au Millionième, and those mostly not obtainable in war-time. A chapter in Dr. Mill's 'Record of the R.G.S.,' published in 1930, relates how the sheets were compiled in the Society's House and reproduced by the Ordnance Survey or the G.S.G.S., and how a lady Fellow "became such a good amateur draughtsman that some of her Russian sheets were reproduced from her drawings, and remain to this day the only sheets of Russia in the scheme of the 1/Million map." The same is true now, nine years later. About a dozen of these sheets, which an official list distinguishes by the words "rough style only," and another dozen or two which were redrawn with stamped names by the Ordnance Survey from our compilations, have never been superseded by regular editions. The sheets of Russia are called obsolescent in a paper to the Geographical Congress in Amsterdam last year: but if beginning to die they are taking a long time about it, and they may now be taking a new lease of life. For the U.S.S.R. do not adhere to the Convention de la Carte Internationale du Monde au Millionième; they have produced a 1/M series of their own, but we are not allowed to buy them.

Our sheets of the Europe 1/Million Provisional Series were on the sheet lines of the International Map, but had no pretensions to conformity with the Convention of that map. The original Convention of London, 1909, had just been replaced by the Convention of Paris, 1913, that was not actually published until after the outbreak of war in 1914. There was no time for fine drawing and engraving, nor for layer colouring. The names had to be stamped from type, not drawn. The contours were in brown at 100, 200, 400, 600 . . . metres, not in black with 200 and 500, 1000, 1500 . . . obligatory and solid, 100 "not obligatory but necessary," and intermediate 100's at pleasure, dotted, as provided by the Paris Convention. International boundaries of August 1914 were printed in purple from a separate plate, with an eye to the future. The methods of compilation and the rules for the spelling of place-names and construction of pronunciation glossaries are described in a paper read to a Meeting of the Society on 28 June 1915 and published in the *Journal* for July 1915: the only paper, we believe, that a Secretary of the Society has ever delivered to an Evening Meeting.

By the end of 1918 about a hundred sheets had been compiled and published, or were in course of publication. They had been much used for staff work during the war, and reduced to the scale of 1/1½ Million they illustrated the Treaties of Peace. They were frankly provisional, and seemed destined to a speedy death, for they did not after 1919 fulfil the first requirement of an International Map, that names should be written as they are spelled in the language of the territory represented. Polish names had been taken from the German and Austrian or transliterated from the Russian maps of 1914; Czech names from the Austrian; Turkish names transliterated from the Turkish, with results very different from the present Romanized Turkish.

Between 1920 and 1930 a number of International Sheets conforming more or less closely to the Paris Convention were published: but it did not seem likely that Europe would soon be completely provided with a uniform map of which the sheets would join together as intended. The rules for cooperation in providing material for what should have been joint sheets were not always followed. There was little agreement in the interpretation of the Paris rules for selection of contours, so that neighbouring sheets did not fit properly: one sheet having only the obligatory contours, the *courbes maîtresses*; the next having all the contours allowed. There was the inevitable difficulty of matching layer colours with the official *gamme*, which had been produced at the War Office in such a masterpiece of colour-printing that no one has been really successful in copying it. Moreover there must have been in mind the serious defect of an internationally produced map, that the supply of sheets would dry up in the event of another war.

So some six or seven years ago the Geographical Section of the General Staff took in hand the revision of their and our old Europe 1/Million series, remade name plates to show the official spellings of post-war States, brought railways up to date, layer coloured sheets, but left them still recognizably based upon the original compilations with their brown contours. The Index Diagram to the 1/Million Map of Europe (Series G.S.G.S. 2758, the original series number) in the G.S.G.S. Catalogue for 1938 shows twenty-seven sheets thus revised and layer coloured; and one or two have been published since.

The Index to the series Asia 1/Million (G.S.G.S. 2555) shows fourteen of the original sheets thus revised, or in several cases redrawn to conform exactly with the Paris Convention and thus ranking as sheets of the International Map. But it omits to show some surviving sheets of the original edition. These were published, already layered, in 1916; and we do not know why they have disappeared. They are partly covered by 4-degree sheets of the Indian 1/Million, but the Indian International Series begins with column 41. For many of the sheets there is a special edition with air information overprinted in blue.

This recent revision of so large a central block of the old Europe 1/Million and of its extension south-eastward in the Asia 1/Million puts new life into the whole thing, and ensures to us at the outset the advantage of a continuous map-supply which was gained only slowly and painfully during 1914–18. It is very curious that the Central Bureau of the International Map, in its Report for 1938 recently published, omits these revised sheets of Europe from its lists, of which there are two.

The first is a "List of sheets published on the sheet lines of the Carte du Monde, including not only those published by adhering countries, which conform to the accepted resolutions, but also those which do not so conform, and those published by private societies." It includes the two series of America 1/Million published by the Engineering Club of Rio de Janeiro and by the American Geographical Society, and the outlying early sheets of Europe 1/Million which have not been duplicated by sheets of the International Series; but excludes the recently revised sheets of that map. Thus we read among sheets published by the G.S.G.S. the numbers N.M. 29, 36, 37, 38, 39, 40; the revised editions of M. 30 to 36 are omitted.

The second is a "List showing all sheets published on the sheet lines or in the style of the International Million Series." It shows that the sheets N.M. 29, 36 to 40 were published by Great Britain in 1918 and 1920, but omits the revised sheets.

The lists of the Report of the Central Bureau for 1938 are seriously defective in this and in other respects. For example, they do not include the six sheets of Libia published by the Istituto Geografico Militare, Firenze, in 1937 as provisional sheets of the Carte Internationale, nor the fourteen sheets of Ethiopia (not all full sheets) published from 1934 to 1936. Nor do they show the eight new sheets of America 1/Million published by the American Geographical Society in 1938. The Spanish sheets H. 28, J. 30, K. 29 and 30, which are shown in the Lists as published in the International style in 1928, were acquired for our collection when the Commission of the International Map met in London in July of that year, but have never, so far as we can ascertain, been placed on sale as separate sheets: the Instituto Geográfico y Catastral has combined them in two sheets, Mapa General de España y Portugal, with inset of the Canary Islands, published in 1932.

Since the Index plate of the Central Bureau report cannot distinguish the G.S.G.S. series, and the G.S.G.S. Indexes are not in the least concerned with the International Map except for sheet lines, it has seemed useful to make an Index which shows the whole of the original Great War series of Europe and Asia 1/Million maps, with their sheet names, dates of first and

latest edition, and indication of their present condition, revised and layered, or still in their provisional form without layers, or still in their very provisional state of "rough style," which means reproduced from very neat compilation traces made by Mrs. Reynolds. The revision has made one change which we do not think is for the better: the sheet name is now in the English conventional form, *e.g.* Florence instead of Firenze. The sheet names of these G.S.G.S. maps, which become the principal because complete series, run diagonally across our Index compartments, and a sign in the lower left-hand corner denotes the style of the latest edition. When a sheet appears also in the International series, fully conforming to the Paris Convention, its name, date, and style are indicated in the top left-hand corner: when it purports to be of the International pattern but does not conform in essentials such as contour interval or spelling of place-names, it is shown in the lower right-hand corner. Specially combined sheets with irregular sheet lines such as those of Great Britain, or of Spain and Portugal, do not properly belong to any of the 1/Million series, and are not shown on our Index, though included in the lists of the Central Bureau.

A study of our new Index makes it a little difficult to agree with the Secretary of the Central Bureau that the Carte Internationale is a very fine example of sound international cooperation. The first essential of cooperation, that each State should compile the map of its own territory, and make each its own contribution to the content of a joint sheet, has rarely been fulfilled. Its absence has been deplored in successive reports, and the effect of that non-cooperation is conspicuous on many sheets. There are, for example, two versions of sheet N.N. 34, both labelled Carte Internationale du Monde au Millionième. The Wojskowy Instytut Geograficzny published it under the name Warszawa in 1926, with the German portion carefully compiled, but not by the Landesaufnahme of Berlin, which in the following year published the same sheet under the name Ostpreussen with a different compilation of the German part and the Polish with many names in their German form; so that it is not ranked by the Central Bureau as conforming to the Paris Convention. Or take the adjacent sheets N.P. 32 Trondheim, published by Norway, and N.P. 33 Gävle, made by Sweden. The strip of Norway on the latter was evidently compiled in Sweden, for it is crowded with names on the Swedish pattern, the topographical detail, especially of roads, does not always fit along the common edge, and the contours are not at the same interval.

As an example of how an International map may be turned to national ends, consider the German sheets. They have never conformed, because they have kept the contours in brown instead of black, and German forms of place-names instead of the true forms outside German territory. Thus the sheet N.M. 33 published by the Germans as Wien had Prag for Praha and Pressburg for Bratislava. But when about 1935 Germany gave up labelling her sheets International and called them Uebersichtskarte 1/M, a revised edition of M. 33 published in 1935 had Bratislava, and examination showed that names in Slovakia had been changed from German to Slovak form, while those in Moravia had been left German: a curious anticipation of later but transient events.

The Convention of Paris made obligatory the contours at 200, 500, 1000

metres, and so by intervals of 500; considered that at 100 metres necessary, though not obligatory; and allowed choice at discretion of the others: it would have been useless to impose a close contouring on the first sheets of more or less unsurveyed country. But Europe is mostly surveyed precisely, and any real international cooperation would have avoided the discontinuities which arise from the choice shown in Fig. 1. There is a curious contrast between the representation of England with its gentle undulations and only four contours up to 1000 metres, and precipitous Norway with ten.

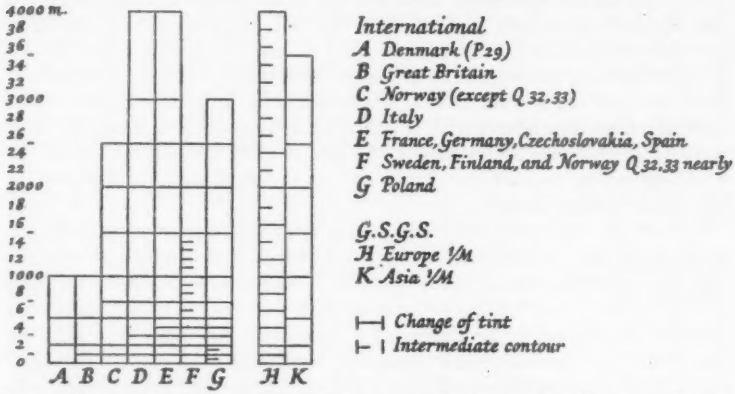


Fig. 1. Layer colouring and intermediate contours adopted by European States contributing sheets to the International 1/M Map
Example: The G.S.G.S. Europe 1/M changes the tint of layer colouring at 100, 200, 400, 600, 800, 1000, 1200, 1600, 2000, 2400, and 3000 metres, and has contours within the layers at 1400, 1800, 2200, 2600, etc.

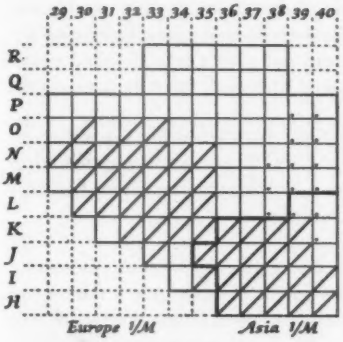
The information contained in our new Index may be analysed usefully in diagrammatic form. Fig. 2 shows the limits of the old British Series Europe 1/M (G.S.G.S. 2758) and Asia 1/M (G.S.G.S. 2555), distinguishing the sheets which are now revised and layered, the sheets which remain in their original form compiled by the R.G.S. and drawn by the O.S. or the G.S.G.S., and the so-called "rough style" sheets compiled and drawn at the R.G.S. These last are wrongly shown in the Central Bureau lists.

Fig. 3 shows the sheets listed by the Central Bureau as International, distinguishing between those that conform to convention and those that do not, and incidentally showing which sheets have been duplicated.

The moral seems to be that if you want a general map covering a continent, consistent in style, and available in quantity, you must make it yourself, and whether you call it International or not is a matter of choice, or expediency, or perhaps of chance.

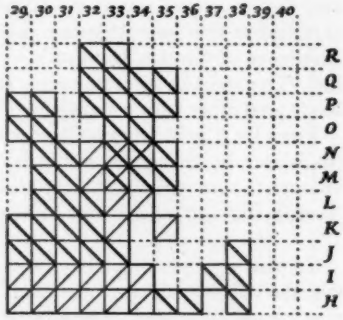
The finest example of such an enterprise is the set, now nearly complete, of 1/M sheets covering all the continent of America south of the United States border, conforming closely to the International convention, and recognized as such by the Central Bureau, though in fact the sheets are entitled America 1/M, as are the very few 1/M sheets of the United States; in the

Western Hemisphere only Canada's three sheets are designated Carte Internationale du Monde au 1/Me. The series we have had under review does not compare in beauty of execution with the A.G.S. sheets, having never really recovered from the hurried circumstances of their beginning. But they will play a good part in the years before us, and we may be pleased to remember that they began life in the House of our Society. A. R. H.



G.S.G.S.

Fig. 2. The sheets of Europe and Asia 1/M of the G.S.G.S. are shown by squares with solid outline; the division between Europe and Asia sheets by a heavy line. The sheets revised and layered are distinguished by a diagonal line: those in "rough style" by a dot in the lower left-hand corner



International Map

Fig. 3. The published sheets of the International 1/M Map are shown by squares with solid outline: those conforming to the Paris Convention by diagonal \, those not conforming by diagonal /

MAP-MAKING ON TRISTAN DA CUNHA

ALLAN CRAWFORD

THE first survey of Tristan da Cunha was made in 1852, when Captain Denham, R.N., F.R.S., was sent to the island in H.M.S. *Herald*. With the assistance of the steam tender H.M.S. *Torch*, he made a running survey. The two ships steamed round the island, taking what bearings they could, and sketched in the rest. Although the resultant chart was characteristic of the excellence of Captain Denham's work, it did not give a true detailed coast-line. To obtain an accurate survey of an island, the work must be done on the land, preferably with a theodolite.

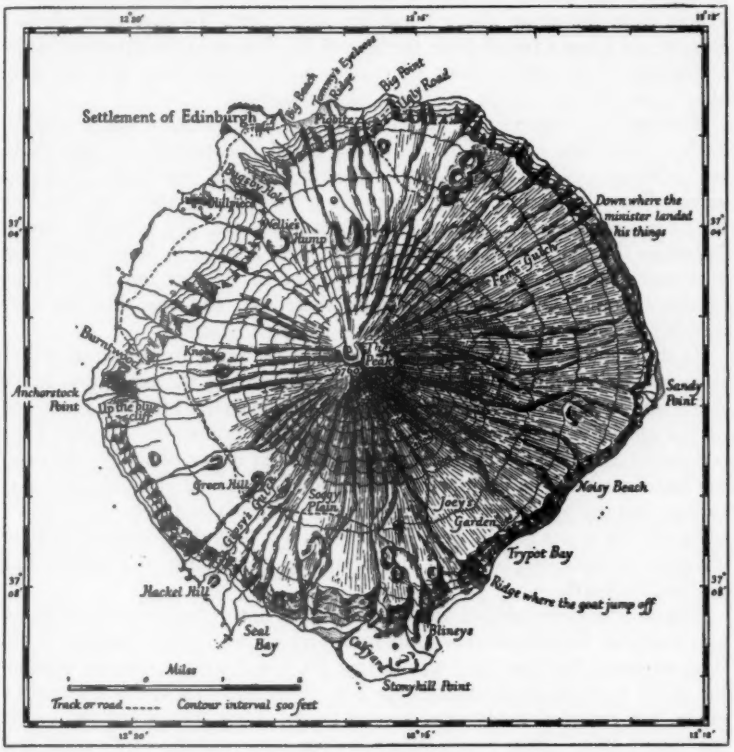
I met Dr. Christophersen, leader of the Norwegian scientific expedition to the island, by chance on a ship bound for Cape Town, and volunteered to attempt to survey the island for him. After a fortnight at the Cape, I left for Tristan with the other members of the expedition.

To plan my work beforehand was almost impossible, as we soon discovered that the charts with which we had been equipped did not give a fair representation of the island. The scheme of work developed in the course of time on the following lines. On the western half of the island, and on the Settlement Plateau, which is 5 miles long by half a mile wide, I established a main triangulation. Inside this were secondary triangulations, the whole network being connected to an observation point on the Admiralty charts. Bearings to the other islands of the group were also taken. Round the coast of the island I worked a coast-line traverse, which was connected to the main triangulation in several places as a check. A base line was accurately measured on the Settlement Plateau.

As soon as the task of building the expedition house was completed, I set off for the mountain accompanied by an islander, who was relieved every two or three days, as a guide and to take some of my load. We scaled the 2000-foot cliffs at Burntwood and pitched camp below the Knobs, about 2500 feet above sea-level. Work was somewhat delayed at the start, for no sooner were we settled in than clouds descended upon us, and for a week we were not able to leave the tent. When the clouds rolled away, I set to work to reconnoitre, planting flags on the tops of hills for my stations. These stations were subsequently visited with the theodolite, and after five weeks the whole of the west side of the mountain had been completed. Walking from one place to another entailed fighting our way through thick tree ferns and bushes, and many gulches, some 200 feet deep, had to be crossed. Fog or clouds often delayed our work. On the south side of the island I was not able to venture anywhere to the east of a district known as Joey's Garden, as it was too thickly overgrown with bushes. I had a station on the top of a ridge known as the "Ridge where the goat jump off," from which one has a delightful view of Stonyhill Point and the Blineye district several thousand feet below. One of my most important stations was on the very highest point of the Peak itself, and I had to climb there four times during my work. It lies in the centre of the island, on the south edge of the crater lake, 6760 feet above sea-level. From this

point one obtains a most remarkable view of the island. As the distance of the Peak from the coast is not more than 4 miles in any direction, the steepness of the slope can be imagined.

For the coast-line traverse I had the assistance of three men at least, and much of the credit is due to the islander Arthur Rogers, whose task was to go ahead with the staff and to choose suitable stations. I had ninety stations round the coast of the island. During this work we made our headquarters in



Tristan da Cunha

caves along the coast open to the roaring of the South Atlantic breakers. I discovered that ground swells can spring up so quickly round the Tristan coasts, and remain for so long, that if one did not take the opportunity of working round a bluff while the sea was calm, the chance was lost for good. The most difficult part of the coast-line to negotiate was round Stonyhill, where only two or three islanders had ventured before. Stonyhill is a mass of loose cinder rock of fairly recent volcanic action. The rocks are separated by small crevices over which grass sometimes grows. The bluff at Big Point was impossible to work round, and I had to have stations inland, taking bear-

ings to the point itself from the last station on the beach. There is no beach at all at Noisy Beach Bluff, where I had to take shots with my instrument from the east end of Sandy Point and Trypot.

Another important station was a large stone beacon which I built round a flag on the top of a hill quite near the settlement known as the Hillpiece. I had fixed this flag by observations from at least half a dozen stations in the south, but upon setting up my theodolite to the north found that it was not in sight. I had placed the station too far to the south, and it was thus not visible from the point where I had the instrument. To save time, Arthur Rogers and I dug a trench from the base of the beacon in the direction of the instrument in the north, about 4 feet deep and 30 yards long, until we were able to see the top of the flag from the instrument.

Through the courtesy of her commander, I was able to get a passage back to the Cape when H.M.S. *Milford* called unexpectedly at the island on 27 March 1938, two days only before our intended departure. This was extraordinary luck; in the past, three years have lapsed when the islanders have had no connection with the outside world at all. We called at Gough Island on the way, and the captain landed with a party to hoist the Union Jack and declare the island a dependency of St. Helena, on instructions of the Colonial Office. I went ashore there too, and was thus the only member of the expedition who set foot on Gough Island.

At the Cape I was given the most valuable assistance by the naval authorities in the compiling of my charts, which were sent by the expedition to the Admiralty in London for examination. My results showed that the coast-line on the official charts was only recognizable in the immediate vicinity of the settlement, and that the Denham survey had been drawn about $7\frac{1}{2}$ per cent. too large in area. The position of Inaccessible Island on the old maps was correct, but my bearings to Nightingale proved that it had been charted $1\frac{1}{2}$ miles too far to the south. Seal Bay, which is a large bay on the south of Tristan, $1\frac{1}{2}$ miles long by half a mile deep, had been shown as a straight line on the old charts.

The old charts revealed to us the fact that out of the twenty-four names for topographical features marked, only four were known by the islanders at all. Two scientists had lost their way during the first fortnight that we were on the island in trying to discover Swain Bay. They had ventured out without a guide, but returned safely after several hours. They then asked the oldest inhabitant, "Old" Sam Swain, where his bay was situated. Sam's reply was that he had never been there and in fact never knew that it existed. It appears that in 1852, when the original survey of the island had been made, there were no names available, and the surnames of the islanders were placed here and there on the chart at random. I therefore decided to collect the islanders' own names for all the topographical features on the island. In all I collected two hundred and ten names, most of which appear on my finished charts. As far as possible I ascertained their origins, and they revealed some interesting facts. The islanders have never deliberately given any names at all. They are either descriptive—such as Green Hill, Sandy Point, Soggy Plain, Up the blue cliff, the Hill with a hole in it, and the Ugly Road—or they record an incident which happened at a certain place in the past. Under this latter heading we

have such names as Gipsy's Gulch, Blineye, Nellie's Hump, Joey's Garden, Pigbite, Anchorstock Point, and Deadman's Bay. At Gipsy's Gulch, for instance, a dog called Gipsy had been chasing a goat on the mountain when she fell into the gulch and was killed. Naturally enough this gulch—having no name—was for many years described as the "Gulch where Gipsy fall in." (The islanders seldom use the past tense in speech, so would not say "fell.") After one hundred years of constant usage, this long descriptive name was gradually contracted to Gipsy's Gulch.

Blineye is a district on the Stonyhill Plateau where an ox which was blind in one eye used to remain, as it had difficulty in moving from place to place with the rest of the herd. For many years, and sometimes even nowadays, this district is still called the "Ridge where Blineye stop." Perhaps the most comical name on the island is the "Ridge where the goat jump off." That is the name of the top of the cliffs above Blineye, and it was here that a goat which was being pursued by an islander leaped over the cliffs into the sea several thousand feet below. In this case no natural contraction has yet taken place. A deep gulch close at hand often visited by the islanders for young "mollies" and other sea birds for eating purposes is called "Gulch come down the west side of the ridge where the goat jump off."

When the Reverend and Mrs. Barrow arrived at the island in 1906 at the start of his mission, there was a ground swell running at the Settlement which did not permit a landing there. Their ship proceeded in the direction of Sandy Point, which was in the lee, and there, on a sandy beach about 2 miles to the north of the point itself, they and all their belongings were set on shore by the ship's boats. This beach has ever since borne the name "Down where the minister landed his things," and it is because the sentence goes with a swing when said that no natural contraction has taken place.

Anchorstock Point is where the stock of an anchor was washed ashore. Berries grow in the Berry Gutter, gutter being the island name for a small gulch. There are many picturesque names, such as By the big piece, Redbody Hill, Up the blue cliff, Calfyard, Devil's Hole, Katie's Orchard, etc. The stream which flows past the settlement is called the Big Watron, "Watron" being a corrupt form of "watering."

The name which has suffered the most belongs to the district "Tommy's Eyeloose." It was only "Old" Sam Swain who could enlighten me on its origin. When the garrison from the Cape arrived at the island in 1816, they found an old Italian, Tomaso Corri, who possessed much wealth. With the aid of a young Spaniard he was carrying on a prosperous trade, selling whale oil and seal skins to passing ships. He had a hut near the Ridge, on the east end of Big Beach, in which he tried out blubber to extract the oil. So the hut was known as "Thomas Corrie's Oil House," and the years have corrupted it to "Tommy's Eyeloose."

There were a few names the origins of which I could not obtain. These included Bugsby Hole, Knockfolly Ridge, Hackel Hill, and Fern's Gulch. But Bugsby Hole can be traced to the east end of London, and was probably given by one of the original settlers at the island who was, no doubt, a cockney. In that case it is the only name which has deliberately been given.

REVIEWS

EUROPE

STRUCTURE, SURFACE, AND DRAINAGE IN SOUTH-EAST England. By S. W. Wooldridge and David L. Linton. (The Institute of British Geographers. Publication No. 10, together with No. 9—"Transactions," pp. v–vii.) *London: George Philip and Son*, 1939. 10×7 *inches;* viii–xvi+124 *pages; maps and diagrams.* 12*s* 6*d*

Dr. Wooldridge and Mr. Linton are well known for their studies on the geomorphology of south-eastern England, but here, for the first time, they present the results of their researches in a complete description of the land-forms of this much-studied region, which must now rank with the northern Appalachians as classical ground of geomorphology. The authors offer their results as a contribution to regional geography and as a basis for future work on regional lines. Although it is no part of their object to develop this aspect in the present study, they make suggestions from time to time that throw a vivid light on the influence of physiography on human occupancy and other problems of regional geography. But quite apart from any such function, the publication of their findings justifies itself as an essay in geomorphological evolution. Stage by stage, from the Palaeozoic floor and its deformation to the invasion of East Anglia by ice, they trace the growth of structures and relief over the area lying south and east of the main chalk escarpment from Dorset to the Wash. This area, perhaps better known than any other part of Britain, has also been the victim of more simple and erroneous generalizations, *e.g.* the Thames is a longitudinal consequent stream; the Weald is a denuded dome with simple radial drainage; the Chiltern Hills are a simple chalk cuesta. None of these things is true, some of them are extremely misleading, and the more they are studied the further is the explanation found to depart from the naïve simplicity of the text-book.

A useful feature is the number of clearly executed maps and diagrams, especially the maps showing the elements or facets in the physiographic design. In so well illustrated a book it is perhaps uncharitable to complain of the absence of large-scale maps of small areas taken in detail. But the small scale of most of the maps, *e.g.* 1 inch=20 miles, and the requirements of clarity have prevented the insertion of place-names; and since, in order to follow the closely reasoned argument, it is necessary to locate rivers and hills whose names are often unfamiliar even to one who knows the south of England moderately well, much labour and not a little irritation are expended on having to locate these features on a large-scale topographic map. A. A. M.

THE ORIGIN AND DEVELOPMENT OF THE PORTS OF THE United Kingdom. By Sir David J. Owen. *London: Allman and Son* (1939). 9×6 *inches; 374 pages; illustrations and location map.* 12*s* 6*d*

There is a fair amount of literature relating to individual British ports: most port authorities publish an annual volume giving details of the history, facilities, and trade of the undertakings which they control, and there is a considerable body of geographical literature, from large works like that of Rodwell Jones on 'London river' to articles in the various geographical magazines; but the information is for the most part scattered, and in presenting within a single volume a survey of the history and present condition of all our ports—from the greatest, like London and Liverpool, to the smallest, like Wisbech and Truro—Sir David Owen has certainly performed a useful service. It is obvious however that within the compass of 350 pages only the barest outlines can be given,

and the book can be little more than a compilation from port authorities' handbooks and the official trade statistics.

There is a brief introductory chapter on the origin and nature of ports, in which it is stated that the 330 ports of the United Kingdom "receive each year . . . goods of a value of about £1,037,824,428," and a still briefer concluding chapter on the coordination of ports and transport. Between these two, each port is dealt with separately, the larger ones first, each with a chapter to itself, then the smaller ones grouped regionally. The transition stage, in the middle of the book, involves such curious juxtapositions as Blyth sandwiched between Plymouth and Dover, and the Hartlepools between Garston and Barrow.

The text appears to be accurate on the whole—though the statement that one of the principal imports of Swansea is copper ore would seem to be several decades out of date—and the statistics relate generally to the year 1937. There are a number of excellent photographs which have suffered severely through being printed on the same paper as the text. The preface states that the volume is an attempt to inform the student of transport as well as the general reader, and for this reason the complete lack of bibliographical references is to be deprecated.

S. H. B.

BRITISH SHIPPING. By R. H. THORNTON. (English Institutions. General editor: Lord STAMP.) *Cambridge: University Press*, 1939. 8×5 *inches;* viii+304 *pages; illustrations.* 7*s* 6*d*

This book presents a fascinating and inspiring picture of a great industry. Writing from within, Mr. Thornton has obviously had practical experience of most aspects of the shipping business of which he writes, but he has also a marked ability to write clearly and entertainingly, and technicalities are reduced to the bare minimum which is necessary for the understanding of such subjects as ship construction and propulsion. Perhaps the main impression that will be left in the mind of the average reader is the intricacy and complexity of owning and running ships. It would have taken a series of similar volumes to describe all the many ramifications in detail, and the author himself confesses that many of his statements are over-simplified.

The first part of the book deals with the history of the British Mercantile Marine from about 1800, *i.e.* from the introduction of the steam engine as a means of propulsion. It is a stirring tale of invention, of the triumph of steam over sail and of steel over wood and iron, and above all of sound business development; but it ends with a gloomy chapter entitled "Economic nationalism: 1919–1938," in which the present difficulties of British shipping in competition with the state-subsidized lines of many foreign countries, and with foreign ships whose standards of service and wages are on much lower levels, and the futility of the ever-increasing economic war produced by the present policies of national self-sufficiency, are clearly set forth.

The second part deals with the actual business of running ships. There is a brief account of the various types of ship, *e.g.* tramp, cargo-liner, passenger liner, and of the different problems involved in running them, an interesting chapter on the rudiments of the law of carriage by sea, accounts of dock-side procedure, cargo stowage, of the office work involved, and of the duties of the men who man the ships. There is also a most entertaining chapter on passengers, as seen through the shipowner's eyes, and finally two chapters on the international and financial aspects of the business of shipowning. The reader will many times be tempted to ask—how do any ships ever pay, and why is any one so foolish as to engage in the business of owning and running them? The answer is supplied at intervals throughout the book ; it is the long and

honourable tradition, much of it family tradition, behind the industry, the shrewd business acumen which has characterized generations of shipowners, and above all the indomitable spirit of the men who make up the British Mercantile Marine.

The book is attractively produced and is illustrated by a number of beautifully reproduced photographs of ships old and new and of various aspects of the work of running a ship. To quote the writer on the dust cover, "this book will be enjoyed by you, whoever you are." S. H. B.

POLAND: key to Europe. By RAYMOND LESLIE BUELL. *London: Jonathan Cape*, 1939. 8×5½ *inches;* 358 *pages; map.* 10*s* 6*d*

This book, the product of a visit to Poland by a trained observer in 1938, is described by its author as a "case study in present world distress." Largely because Dr. Buell never loses sight of the international background to Poland's problems, his account of the country is well balanced. He is generally sympathetic towards Poland's struggle for independence, but by no means blind to her failures.

The first four chapters deal with the history of Poland and the constitution of the Republic. Geographers however will be more interested in the middle sections which describe the economy of the state. The author sees Poland's difficulties as those of eastern Europe in general—density of population and lowness of agricultural yield—augmented by geographical disadvantages and by lack of industrial experience in the nineteenth century. Hence the reliance on state capitalism. From a discussion of this Dr. Buell passes to agriculture, and the need for reform in a country in which two-thirds of the population are engaged in farming and two-thirds of the farms are too small to support their owners; despite which Poland managed to export grain and pork. From rural over-population he proceeds to the discussion of emigration and Poland's colonial claims, and finally to three chapters on the minorities and foreign policy. The chapter on the Ukraine is a useful reminder of the past fluidity of boundaries in eastern Europe, and of the chronic divisions amongst the Slav peoples.

Dr. Buell has drawn upon many sources, all acknowledged, for his information. His book, indexed and provided with a map, is very readable, and its summaries a model of clarity. J. P. H. M.

A WINTER WITH FINNISH LAPPS. By NORAH GOURLIE. *London: Blackie and Son*, 1939. 8½×5½ *inches;* xii+244 *pages; illustrations and map.* 12*s* 6*d*

Miss Gourlie has given us a travel book of quite exceptional merit, largely because she never strives after effect but relies on her own keen observation. The narrative, lit by a characteristic humour, is at once convincing and fascinating. Miss Gourlie's first visit to Finland was made in the summer of 1937, and like many other travellers she found the country north of the Arctic Circle fascinating not only for its scenery but also for its sparse Finnish and Lapp population. Determined to visit these brave people in winter, she left for Finland at the end of the year and spent the remaining part of winter and the early spring in Finnish Lapland, seeing the country under heavy snow and also during the thaw. Probably no writer in English has entered more closely into the life of the various Lapp groups. Miss Gourlie travelled in their garb, with only slight variations, itself a distinctive product of the environment, and behind a team of reindeer, which after certain tribulations she learned to drive. She describes the gradual lifting of the long winter night, perhaps insufficiently dated, the beauty of the landscape under snow with the aurora from time to

time, and the routine of labour with occasional gatherings for pleasure, sometimes of an exuberant character.

The reindeer are gathered from the hills between October and December, in preparation for the big round-ups in December and January: in the severe weather of winter, with occasional blizzards, they have to be watched and guarded against attacks by wolves and gluttons. The alternations of freeze and thaw in spring make life hard, and in summer the Lapps work almost continuously collecting provender for the winter. From Nūnahamari, the port in a sheltered fiord near the Arctic Ocean, Miss Gourlie visited the remote villages inhabited by the "coast Lapps." An expedition of a more violent character was made on a trawler fishing the Arctic. Visits were paid to the Norwegian and Swedish Lapps, and Easter was spent with the latter.

The social side of life is fully discussed and many of the highly efficient schools and hospitals provided by paternal governments receive shrewd and favourable comment. The folklore and customs of the Lapps are treated with singular penetration, and the clothing of both men and women is described in detail. There is so much of interest and permanent value in the book that the compilation of an index would not have been useless labour. Miss Gourlie is to be warmly congratulated on her work. T. W. F.

ASIA

THE REAL CEYLON. By C. Brooke Elliott. New edition. *Colombo: H. W. Cave and Co.*, [1939]. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 136 *pages; illustrations and map*

Mr. Elliott takes the visitor to Ceylon by the hand and leads him with much friendly and amusing chatter while imparting a great deal of solid knowledge. In pointing out the advantages of an up-to-date hotel he does not omit to draw attention to the historic interest of its site. A long motor journey will be the shorter for his stories of transport forty years ago, for his experience covers that period. Religion and law, birds and beasts, timber trees and pseudo-china, on all these he is enlightening, with personal touches and without a trace of pretentiousness. He understands the villager, and his side-lights on the villagers' mentality will appeal to many who flash past them in comfort as they toil in the burning sun. "Europeans talk of rice and curry. The villager talks of taking his rice. With him the curry is usually a minus quantity." He quotes freely from other writers and indicates the material which will assist further study, though François Valentyn's 'Beschryving' in five great tomes will hardly be recognized under " 'Portuguese in Ceylon,' by Valentyn." Even his descriptions of ancient remains and scenery are not wearisome. For the Englishman he indicates trout streams and golf links. "Put back grass where Master cutting" is the local translation of a rule for the guidance of the Tamil caddies at a club.

Not all the numerous illustrations are of merit, and a map is desirable. The errors, mainly typographical—as where the date of the Portuguese *padrão* at Colombo appears as 1561 instead of 1501—should be corrected in future editions, for there should be such. P. E. P.

TRAVANCORE: a guide-book . . . By Emily Gilchriest Hatch. Second edition. *Bombay and London: Oxford University Press, Indian Branch,* 1939 (*first published* 1933). $7\frac{1}{2} \times 5$ *inches;* 270 *pages; illustrations, map, and plan.* 6*s* (*Rs.*4)

This is a handy guide-book for visitors to one of the most interesting and picturesque areas in India. With a long coast-line facing the Indian Ocean from Cochin to Cape Comorin, and protected on the north and east by the densely

forested highlands of the Western Ghats, Travancore has remained more or less isolated, and so has preserved much indigenous and ancient culture which was submerged or effaced in the other parts of India that have been overrun periodically by invading or warring hosts. Mrs. Hatch describes the country by selecting a series of trips, so arranged as to include all the more important and attractive sites, about each of which she gives appropriate historical, archaeological, and ethnological details, interspersed with local tradition and legend. She has spared no pains in collecting information on all these points from published works and official archives, and from the lips of the people themselves. Practical information is also given, such as lists of travellers' bungalows and sheds, and mileages, besides some useful appendices and two maps. As an example of practical advice may be noted the remark in reference to Pechippara: "such a beautiful place," but "visitors who wish to spend some time there should go well armed with mosquito curtains."

The spelling calls for revision in a few cases. The subjects of the illustrations are suitable, but many of these rather lack definition—a result perhaps of the method of reproduction. Sites such as Porakal, Verapoly, Erumalai, Sabarimalai, Mahendragiri, and the famous Courtallam waterfalls (just beyond the State frontier) might well have been shown on the map. On the whole, this is an excellent little book, and all visitors to Travancore would do well to read it.

C. E. A. W. O.

MENACING SUN. By MONA GARDNER. *London: John Murray*, 1939. 9×5½ *inches;* xx+302 *pages; illustrations and sketch-map.* 15*s*

The author of this book is an American journalist who has lived for years in Japan and is therefore competent to speak with authority of the people who now loom so large in world affairs. In this lies the chief interest of her book; but it also throws interesting side-lights on the other Eastern countries she visited during a recent tour. Mrs. Gardner possesses the born journalist's gift of quick observation, associated with a tendency to too-rapid judgments and unverified statements. Rather too-obvious use is made of local handbooks on population statistics and the like; but the author's own observations are always entertaining and often illuminating; it is in fact the high quality of much of the book that makes its lapses all the more noticeable.

The description of Hainan—evidently written before the Japanese occupation—is of all the greater interest in view of that fact. It is faintly comforting to learn how inhospitable and dangerous are its coasts: a succession of rocky coves "all traps of foam and black jags." But that unfortunately does not alter its strategic importance, guarding the Indo-Chinese coast.

One of the author's careless statements is that "it is only in Indo-China that Eurasians mix freely and without prejudice with Europeans." This is not so. In Java Eurasians ("Indos," as they are called) can and do rise to the highest social rank—even that of Governor.

The attack on French colonial administration as "poor, uneconomical, and inordinately selfish" is unjust, as is that on their native education. The author is apparently unaware of the more than nine hundred medical institutions teaching the principles of hygiene to the natives; of the armies of native midwives that have been trained; of the facilities for higher education; of the revival of dying native arts by means of the remarkable "School of Cambodian Arts" and the "Corporations" for the same purpose, whose beautiful products are finding their way all over the world through Paris. She censures the Public Works Department for failing to rebuild a washed-away bridge, but she forgets that the level of the Mékong is at least 25 feet higher in the wet monsoon than

in the dry. Ferries are therefore the most practicable means of crossing, and they are in use all over the country. The crossing the author mentions however would appear from the context to have been in the Saigon delta, which is linked to that of the Mékong by a system of canals, and not, as she says, in the Mékong delta itself.

The collapse of the Java sugar industry, described in one place as due partly to "the development of sugar-culture in the Philippines" and in another to "the increase of sugar-mills in Malaya," is a bad slip. The causes of Java's disastrous sugar slump were not the Philippines and Malaya, but India and Japan. Japan, formerly a large importer, ceased importations except on a small scale for re-export in 1928, having developed its own sugar industry in Formosa. In India, powerful native financial groups had been at work ever since 1919 to develop sugar-culture in their own country, and sent representatives to Java to "pick the brains" of the Dutch experts, who courteously showed them all they desired to see. In 1931 the Indian Government imposed a high tariff on imported sugar, under protection of which new mills sprang up like mushrooms. The first season thirty were working; and in three years there were one hundred and thirty-five, producing altogether 650,000 tons; with the result that Java, which in 1931 had sent to India 809,700 tons, by 1936 was not sending a single ton.

The author's descriptions of the nutmeg are somewhat unusual. On p. 57 she says they "came floating down on slender wings," and on p. 192 that "the breeze brought the nutmegs whirling down on papery wings . . . and baby monkeys caught the nuts to grind their budding teeth on them." The nutmeg is the kernel of a "stone" imbedded in the heart of a fruit as big as, and rather resembling, a peach. It falls to the ground with a heavy "plop," or is gathered in a rotan cage at the end of a long stick.

The administration of British Malaya finds little more favour in the author's eyes than that of French Indo-China. She suggests as a reason for an alleged lack of mutual understanding that "British, Chinese, and Malays cannot speak one another's language" because "no Briton will be bothered to acquire Malay, beyond the bazaar lingo, and the Chinese feels equipped if he knows English." It is certainly true that the ordinary business man in Malaya often does not trouble to learn Malay properly, but all British members of the Civil Service are obliged to pass a very stiff examination in the Malay language, and all Straits Chinese speak it as a matter of course.

It is particularly unfortunate that Mrs. Gardner should have criticized so carelessly the Dutch system of native education in Java, because it is one of the most costly and elaborate items in their administration and their especial pride. Exactly the opposite of what she states is the fact. So far from the Dutch "not wanting the population to be educated or improved mentally because that would not fit in with the Dutch concept of colonization, which is a process of moulding citizens into good and obedient subordinates," their system, if it has a fault, is that it embodies the risk of converting a contented illiterate agricultural population into a discontented literate one: exactly the same problem, in fact, that has arisen in all countries where the education of the masses has been undertaken. There are schools in every village in Java, even in the most remote, which all boys attend. They are taught by specially trained native schoolmasters, most of whom are tri-lingual, speaking their own mother-tongue, Malay, and Dutch. All natives are now taught Malay, and its increase as a lingua franca throughout the East Indies year by year is very noticeable. As well as secondary schools there are universities where natives can and do qualify for the professions. Many native doctors practise and hold important public health appointments.

Mrs. Gardner remarks that "the Dutch do not appear to anticipate air-attack on Java, and black-outs are unknown." On the contrary, the authorities are only too well aware of the danger. Black-outs have been in vogue for more than two years and are taken quite as a matter of course by the native population. It was a pity that so keen an observer should have confined herself entirely to the tourist's Java. Otherwise she surely could not have fallen into the error of describing the Javanese as a "playboy." To the semi-Westernized product of the town schools the term might appear to the superficial observer to apply; but anything less appropriate to the ever-toiling Javanese countryman it is hard to imagine.

It is naturally in all matters pertaining to the Japanese, whom she really knows, that the author is at her best. Fully awake to the reality of the Japanese threat, she is able nevertheless to retain her sympathy for those of Japan's people who have had the present regime thrust upon them. Most telling of all the pictures she draws are those of the tinsmith, called up for the army, who comes to bid her good-bye at her home in Japan; and of an elderly Japanese shipmate who dared not show his face on deck because no one in the "good nations" liked his people any more.

The book abounds with vivid descriptions of people and places, and bears the impression of one who would be a most pleasant and entertaining travelling companion. H. W. P.

AFRICA

THE TRAINING OF THE UPPER NILE. By F. Newhouse. Published in collaboration with the Institution of Civil Engineers. *London: Sir Isaac Pitman and Sons*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 102 pages; maps and diagrams.* 6*s*

Only an acknowledged authority thoroughly conversant with all the facts could have presented the problems so conveniently. When there is a fresh edition, the heights of some points, as well as the slopes of the several reaches described, might be usefully added; the last three columns in Table I of the appendix might be completed down to the sea. The quantities of water required for full development of Egypt and the Sudan are considered; then the Upper Nile is described, and means of dealing with its problems are discussed with a view to the provision of the water. Though small, the book is of great value as a complement to the 'Nile basin' volumes of Hurst and Phillips. We are told that on an average 28 milliards of cubic metres of water enter the Bahr el Jebel swamps and only about half this quantity passes out at Malakal. Experimental data, with allowance for rainfall, suggest an annual loss of half a metre in depth of water over the swamps. This would imply an area of 28,000 square kilometres; but this area of swamps does not exist, unless the Bahr el Ghazal swamps are also involved. The manner of the loss remains unsolved. The impermeability of the soil of the swamps was proved by means of a number of tanks made in it at various points along the Bahr el Jebel. Though the loss of water into the bed of the swamps seems negligible, a considerable amount must be lost when levels rise and water spreads over and saturates the cracked ground, for none of this returns.

In order to increase the supply for irrigation in Egypt, various projects have been considered. Canals from the upper Bahr el Jebel to the Veneno or to the White Nile have been found costly, and we are now presented with schemes for remodelling the Bahr el Jebel. Either a single bank may be thrown up on the west or it may be enclosed between two banks about 1·7 kilometres apart. As both ground- and water-levels in the swamps at a distance are below those of the main channel, the banks will have to be about 4 metres high. The fact that

there will be an early return for the expenditure and the water supply will be increased is a strong recommendation for these schemes. On the other hand we do not know what difficulties may arise from the growth of vegetation between the banks; the increased range of levels may not suit some of the plants.

There is no index, but there are useful maps, diagrams, and tables and the whole is convenient and valuable for reference. G. W. G.

KAMERUN. By GEORG ESCHERICH. *Berlin: Hans Riegler*, 1938. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 232 pages; illustrations. M.7.75*

Except for the last chapter, a short one, this book relates entirely to an expedition undertaken twenty-six years ago, and the author confines himself closely to his period and line of march. He was sent out by the German Government to explore and especially to report on the forestry of territory that had recently been ceded by the French, much of it being very little known. He landed at Ukoko just south of the Spanish colony of Muni, through part of which he passed, and travelling north-east eventually reached the Sanga river, down which he passed by boat to the Congo, whence home. His party consisted of a hundred natives in all, boys, carriers, escort, and the wives of some of his men.

There is considerable dissertation on every occurrence for the purpose of informing the new generation of Germans that knows not West Africa what living and travel conditions were like in those days. "Forest and swamp, swamp and forest, with occasional villages the only variation": such was the march through the low-lying rain-forest until they entered the grassland at higher altitude. Here Herr Escherich becomes slightly enthusiastic and, commenting on the delightfully cool nights, remarks how suitable this open country would be for white settlement. It requires however something more than cool nights and grassland with indifferent grass to make it a future home for the white race. The vertical sun is always there. There was sleeping sickness too in places which the German Government was taking measures to control.

In those days English was the language of communication between the Germans and the Cameroons natives. Though the country had not been under the British flag, British influence through missionaries and trade had penetrated deeply, so much so that at the invitation of the Coast tribes it was intended in 1884 to annex the country. Delay occurred, and the Germans entered. It is only in the last chapter that Herr Escherich refers to the "Colonial question" as viewed in Germany, and he writes with moderation. Naturally he laments the loss of Cameroons to the Reich, but he does not seem to recognize that the title of the present-day occupiers rests on conquest.

The photographs are well reproduced. It is a very readable book.

F. W. H. M.

NORTH AMERICA

STUDIES IN THE ECONOMY OF THE MARITIME PROVINCES. By S. A. SAUNDERS. *London and Toronto: Macmillan and Co.*, 1939. $9 \times 5\frac{1}{2}$ *inches; xii+266 pages. 8s 6d*

This is a collection of essays of unequal value and significance. After a brief geographical introduction which, being unrelated to the ensuing historical matter, proves entirely true to type, the first half of the book consists of a concise, readable, and obviously well-informed summary of the economic history down to 1783.

The importance of the West Indian trade, the rather unusual features of the

English Fisheries of Newfoundland, and the disadvantages suffered by the French at this period are specially emphasized and illustrated.

There follow two studies on the Reciprocity Treaty, the effects of which on the trade of the Maritime Provinces, and on that of the rest of Canada, are critically considered. The author points out that concurrent circumstances may well be deemed responsible for much of what has usually been laid to the account of the Treaty and of its abrogation.

The remaining chapters on basic economic problems, agricultural production, and trends in the economic history of the Maritime Provinces, though useful summaries, are altogether too slight to be of much value. L. R. J.

AUSTRALASIA AND PACIFIC

A VOYAGE TO NEW HOLLAND. By WILLIAM DAMPIER; edited by J. A. WILLIAMSON. *London: The Argonaut Press*, 1939. 10×6 *inches;* lxxvi+266 *pages; illustrations and maps.* 12*s* 6*d*

This book completes the Argonaut Press edition of Dampier's voyages, of which the first volume, edited by Sir Albert Gray, was published in 1927. The present issue contains that part of Dampier's writings which describes his voyage in command of H.M.S. *Roebuck* to Australia, New Guinea, and the neighbouring islands from January 1698/9 to February 1700/1, when the *Roebuck* foundered on her way home off the Island of Ascension from a leak due to hopelessly rotten timbers.

Dampier established his reputation as an observer and writer by his first book—'A new voyage round the world'—which appeared in 1697, followed in 1699 by his 'Discourse on winds.' These works brought him to the notice of both men of science and the officials of the Admiralty, who asked him to plan a voyage of exploration and despatched him in the inadequate *Roebuck*. His account of the voyage was published in two parts, one in 1703 and the other in 1709.

Like his earlier books, the voyage to New Holland contains much more than a narrative of adventure. Dampier gives accurate descriptions of the seas and lands he visited, correcting the older "draughts," and of their inhabitants—men, animals, and plants. He records winds, currents, and tides, and gives a "Table of Variations" containing more than one hundred and thirty observations in different places for the difference between the geographic and magnetic meridian. He notes with pleasure that these observations agree with the "general scheme" of Captain Halley. Here Dampier made a real advance in the early science of terrestrial magnetism.

In his introduction, Dr. Williamson gives an account of Australian exploration before Dampier's time, a description of the voyage to New Holland and of the courts-martial which followed, and a conclusion summarizing the effects of Dampier's work. This introduction as a whole is interesting, but shows some curious lapses for an editor of Dr. Williamson's standing. He accepts 1652 as the year of Dampier's birth, though it was shown to be 1651 in *Notes and Queries for Somerset and Dorset* in 1906/7, repeated in *Notes and Queries* in 1928, and rediscovered by Clennell Williamson and published in his Life of Dampier in 1929. To this last-named book, which besides being interesting reading contains some new facts, Dr. Williamson makes no reference. Again, although he deals towards the end of his introduction with the literary output which followed the publication of Dampier's voyages and Woodes Rogers's account of his cruising voyage round the world on which Dampier served as pilot, he does not mention Mr. Bonner's recent important work on the subject.

It is unfortunate that writers of biographical matter do not consult the present members of the families concerned before starting on their task.

W. C. D. D.

POLAR REGIONS

THE CONQUEST OF THE ARCTIC. By Louis Segal. *London: George Harrap and Co., Ltd.*, 1939. 9×6 *inches;* 285 *pages; illustrations and maps.* 10*s* 6*d*

It is difficult to understand why general histories of arctic exploration appear regularly when so few of them make any new contribution to the subject. This book by Dr. Segal is scarcely an exception, though it gives more space than usual to Russian activities. Yet in spite of its author's long association with Russia he has little new to say about her work in the Arctic. One feels that more might have been expected than a précis of books which have already appeared in England, such as those describing the *Chelyuskin* rescue and the Soviet Polar Drift.

In the account of other parts of the Arctic, Dr. Segal has certainly nothing new to say, and moreover he has several errors and omissions. For example, there is great confusion in his account between the half-breed inhabitants of most of Greenland with the few pure-blooded Eskimos in the north and east, and in another place the reader is led to suppose that all Eskimos are heathen and uncivilized, whereas probably half of them at least have been baptized. Again, from the list of mineral resources in Greenland, cryolite, by far the most important, has been omitted altogether. A book which devotes three chapters to the Soviet drift but only describes one crossing of Greenland can scarcely be said to justify its general title.

The map at the end is clearly drawn, but is by no means up to date. Moreover there is a very bad mistake in it, for the three main ice-caps of Iceland are shown as lakes, and Vatnajökull is even specifically labelled Lake Mývatn.

The book is written in a rather slipshod style, with a frequent use of the words "and so on" to end a sentence. There is a great deal of the common cant about explorers being "almost a race apart" and inspired by "selfless devotion to the cause of science, the thirst for knowledge and the desire to win fame for their country," which one scarcely expects to find outside the cheaper press. The frank narratives of some recent expeditions should have cleared away these mists of sentiment, and made it clear that explorers only differ from other men—if at all—by reason of a greater love of adventure and the opportunities to gratify it. The desire for personal distinction and even for monetary gain has played a great part in stimulating exploration.

There still remains to be written a really up-to-date and comprehensive history of arctic exploration, unbiased and accurate. It would have to consist of several volumes and be regarded as a work of reference, but its place will never be filled by the type of history produced at present, in which adventure is given more space than the advancement of knowledge, and expeditions are mentioned or omitted according to the whim and nationality of the author. J. W. W.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

A SOURCE BOOK IN GEOLOGY. By Kirtley F. Mather and Shirley L. Mason. *London: McGraw Hill*, 1939. 9½×6 *inches;* xxii+702 *pages; illustrations.* 30*s*

The enormous growth in the material of modern science compels even the advanced student to rely more and more upon text-books for any but the most

recent results of research, and the elderly teacher is often startled at the ignorance of his best students about the work of the great pioneers of science. Hence the need for such books as this, where the student may get first-hand knowledge of the history of his science out of excerpts from its classics.

The history of geology begins with Leonardo da Vinci, that stupendous genius who established the science in his stride, being the first recorded person to deduce its principles from first-hand observations. It is interesting to contrast his direct inferences from fossils, evidently collected and examined with care, with the ingenious arguments by which, three hundred years later, they were explained away by Voltaire, who could never have seen fossils in the field or applied to them the method of Zadig. It is with Leonardo that this book rightly begins, following him up by extracts from some one hundred and twenty-five later writers, the last of whom were still alive a few years ago.

The selection of authors is very well made. Here the student may read what Steno wrote three hundred years ago on fossils and crystals, Hutton's summary of his uniformitarian theory of the earth, Cuvier's views on catastrophism, Murchison's founding of the Silurian and Lapworth's of the Ordovician system, Pratt's and Airy's views on the gravity anomalies of the Himalaya, Dutton's enunciation of the principle of isostasy, and many other landmarks of geological progress.

English geologists may feel surprise that no place is found for Verstegan or Plot, and that the extracts from Robert Hooke should not include his pregnant suggestion that it might be possible to "raise a chronology" from fossils. But no selection can ever satisfy everybody. We hope that students will not be content simply to read this book, which should be in every geographical or geological library, but that it will stimulate them to search for themselves among the works that should never be forgotten. A. M. D.

GEOMORPHOLOGY: an introduction to the study of landscapes. By A. K. LOBECK. *London: McGraw-Hill*, 1939. $9\frac{1}{2} \times 6$ *inches;* xii + 732 *pages; illustrations and maps.* 25*s*

Professor Lobeck has written a very stimulating and attractive book on the study of landscapes. He suggests that with abundant opportunities for travel there should be a widespread desire to understand the origin of landscapes, yet it is surprising to find that geomorphology is a closed book to most people. The present work is intended to serve as an introduction for the use of college students and others.

It may be noted that Professor Lobeck's 'Geomorphology' is chiefly concerned with landscapes, and that little attention is paid to the wider aspects of earth form and structure. Thus Lowthian Green's tetrahedral theory, Suess, and Wegener are all mentioned in a short paragraph; naturally the treatment is dogmatic, and the reviewer thinks that the first chapter makes a rather unattractive introduction to the book as a whole.

The sections which follow, on rocks and structures, weathering, underground water, rivers, ice, shore-lines, wind, etc., are on the whole very comprehensive and up-to-date. There are many references after each chapter; a large proportion of these deal with American publications, but much modern British work is quoted. British students would need some guidance in their choice of reading, but many will find these references extremely valuable.

One of the most striking features of this new book is the large number of illustrations. More than 170 pages (of a total of 731 pages) are fully occupied by excellently reproduced photographs; there are in addition many line-drawings and tables. In general the photographs immediately precede the chapter to

which they refer, while other illustrations adjoin the relevant text. Following the text of each chapter are pages of maps reproduced from various foreign (non-American) maps to illustrate the features discussed; lists of suitable U.S. maps are also given.

There are also numerous topics for investigation and other questions for the reader; the author admits that some of these "will probably be found exasperating and occasionally unanswerable." The numerous tables may facilitate the students' work, but in some cases there is a danger that their brevity may mislead. For instance, the information (p. 40) that the characteristic physiographic forms produced by conglomerates are ridges and mountains, while slate produces lowlands, requires some elaboration. The reviewer has noted few slips, but a picture of a monoclinal fold on the Welsh coast (p. 35) is referred to central England.

No doubt this book will be widely used by American students; it will also form a most useful addition to geographical libraries in this country. A student cannot fail to find much in it to stimulate his interest in the origin of landscape.

A. E. T.

THE NATURE AND ORIGIN OF COAL AND COAL SEAMS. By A. RAISTRICK and C. E. MARSHALL. *London: The English Universities Press*, 1939. 9×5½ *inches;* xvi+282 *pages; illustrations.* 12*s* 6*d*

This little book undoubtedly fills a gap in the literature of coal and should serve its purpose well. From the preface we learn that "it is intended only as a contribution to the correlation and closer linking of the practical problems of the miner with the laboratory results of the research worker, in order that both may gain a new orientation, and may perhaps place their particular problems in a wider background."

The ordinary reader might perhaps cavil at the reviewer's description of the book as "little," but its thirteen chapters deal with subjects almost every one of which needs, for full treatment, a book of the same size; so rapidly has research on coal advanced in recent years that such books do not exist, and, if written, would probably be out of date before publication. It is therefore exceedingly useful to have this summary of the present position. The scientific specialist will find little in the way of criticism, but will be glad to have the digest, with a useful bibliography of branches of coal research outside his own particular line. The practical man will learn what the scientific workers who approach him are driving at and the many ways in which work, apparently academic only, leads to results of economic and practical value.

The above remarks should not obscure the fact that the book has much general interest. The elucidation of the details of coal-swamp geography by tracing what the miner calls wash-outs, most of which are fossil stream-courses, and the discussion of fossil earthquakes have an obvious fascination. The late Professor P. F. Kendall, to whom the book is dedicated, was the great exponent of these subjects, but much of the evidence was collected for him by Dr. Raistrick.

There are no pages 1 to 12, the first page of text, following page xvi, being numbered 13. There is here some slight confusion between stratigraphical formations and eras of time. In the section on building stones of the Coal Measures the architect's and mason's term "York Stone" should be mentioned, as also perhaps the artificial paving stone made from chippings of the same rock; in this chapter the section on oil is already out of date. The initials A.F.D. on p. 151 will puzzle many readers; although the words with the same meaning are used on the same page they are in the usual order—dry, ash-free

basis—and the initials are not explained till p. 209; a footnote, page reference, or inclusion in the index would solve the difficulty. We do not expect a geologist to write "this strata was . . ." (p. 95). C. N. B.

WEATHER IN THE MAKING. By DOROTHY FISK. *London: Faber and Faber, Ltd.*, 1939. 8×5 *inches; 234 pages; illustrations and charts.* 8*s* 6*d*

Miss Fisk's book is to be recommended as an exposition of weather processes on popular lines, the more especially as some of the difficult facts and theories of modern meteorology are presented in a remarkably lucid and readable manner. The chapters on clouds, illustrated by excellent photographs, are perhaps the best, and better descriptions of the phenomena of the high stratosphere known as mother-of-pearl clouds and the still higher luminous night clouds would be hard to find.

The style of the book however is a little odd, and in places is marred by redundant phrasing. Moreover the work will need careful revision for a second edition, *e.g.* the statement that "Rainbows must therefore be looked for in the morning and in the evening; they cannot be seen at midday except in very northern latitudes, where at noon the sun is still low in the heavens" (p. 168). This is bad, as it almost implies a want of familiarity on the author's part with the fact that for more than half the year the midday sun in Great Britain is below the critical angle of 42° for rainbows, and that with the December sun only about 15° above the horizon at noon in England and 10° in Scotland they are common elements of our midwinter landscapes. But there is only one really unsatisfactory chapter, namely XI, entitled "The weather prophet." In this the existence of a certain amount of evidence for the association of great volcanic upheavals like Krakatoa, Pelée, Katmai, and others with a subsequent lowering of world temperature leads to quite unjustifiable inferences. The statement that since 1912, the year of the Katmai eruption, no winters of abnormal severity have occurred is highly erroneous, since the winter of 1928–29 was in much of northern, eastern, and central Europe the most rigorous for a century. On p. 213 the statement that a pressure inversion is characteristic of anticyclones is obscure, and presumably temperature inversion is meant.

L. C. W. B.

ECONOMIC AND HISTORICAL GEOGRAPHY

THE VOYAGE OF PEDRO ÁLVARES CABRAL TO BRAZIL AND India from contemporary documents and narratives. Translated with Introduction and Notes by W. B. GREENLEE. (Works issued by the Hakluyt Society. Second Series. No. LXXXI. Issued for 1937.) *London:* 1938. 9×5½ *inches;* lxix+228 *pages; illustrations and maps*

In the popular imagination Cabral's expedition of A.D. 1500 is thought of mainly in connection with Brazil. It is the purpose of this volume "to consider the voyage as a whole, including the influences which preceded it and the results which followed." After reading it, few will wish to dispute the Editor's contention that "the voyage appears of greater significance, and some light is thrown on the question of the westward diversion of Cabral's fleet."

While we may not be satisfied in every case of the literal accuracy of the translations (it is noteworthy, for instance, that the translation which Mr. Greenlee gives on p. 167 of the crucial passage in the Memorandum attributed to Vasco da Gama differs radically from that supplied by Professor S. E. Morison in the *Mariner's Mirror*, vol. 24, pp. 407–8), we must congratulate the Editor on the caution and skill generally displayed by him in dealing with

obscure Portuguese idioms. He is equally cautious when approaching such controversial topics as the discovery of Brazil. Usually he is prepared to let his readers draw their own conclusions and seldom allows himself the liberty of a personal opinion; but he does finally make it clear that he favours the "accidental" theory and that he regards Cabral as the real discoverer. Such a view, of course, is not without its difficulties, particularly to one, like Mr. Greenlee, who is a firm believer in the alleged Portuguese "conspiracy of silence" (*e.g.* pp. xxxv, xxxvii) and who is well aware of the strong claims made for a prior discovery. Nor is it very convincing to read that "the chief motive [for the *westward* diversion of Cabral's fleet leading to the Brazilian landfall] was to follow the most practicable and safest route to the Cape of Good Hope," when Duarte Pacheco (who possibly accompanied Cabral) writes that the most advantageous route to India is found by "sailing *due south* 600 leagues [from Cape Verde]. . . ." And the 'Esmeraldo de Situ Orbis' was written by royal command less than ten years after Cabral's voyage, with the express purpose of instructing Portuguese sea captains in the navigation of the sea-route to India.

Mr. Greenlee's volume maintains the traditions of the Hakluyt Society for fine production and effective illustration. It is a pity however that the pocket map showing, *inter alia*, the currents of the Indian Ocean was not more carefully revised. G. H. T. K.

HISTOIRE DE LA DÉCOUVERTE DE LA TERRE. By CH. DE LA RONCIÈRE. *Paris: Larousse* (1938). 13×9½ *inches;* viii+304 *pages; illustrations and maps.* 200 *fr.*

Comprehensive histories of discovery and travel have appeared in several countries recently, but this is apparently the first in French. M. Charles de la Roncière is well known as an authority on French maritime history and on medieval cartography and exploration, particularly of Africa. In the present work he has taken a much wider field for study, and has sought to interest a less specialized body of readers. In these conditions, he has succeeded admirably. The style is terse and arresting, the subject-matter interesting, and the illustrations well chosen. Writing principally for French readers, he has naturally emphasized the share of France in contributing to our knowledge of the world and its peoples, and it is this aspect which will be of interest to English readers.

As an outline of a vast subject, the book is comprehensive, though when faced with the multitude of more recent explorers and travellers, the author's choice might occasionally be questioned. Doughty is a notable absentee from the Arabian section, and recent work in that peninsula is largely neglected; there is no reference to the Lewis and Clark expedition in the North American chapter, or to Rasmussen's work in the Arctic. There are also a few confusions; the Murchison Falls were not discovered by Livingstone; Enderby Land was not re-named Graham Land; an explorer of West Australia is hidden under the name "John Perth," and Peary was not accompanied by a white man on his final Polar journey. There are a few misprints in names, and Sir Thomas Roe appears rather curiously as "Rhoé." These however are details which do not greatly affect the purpose of the book, which is to interest the general reader in an inspiring and important chapter of human activity. G. R. C.

THE MONTHLY RECORD

THE METEORITE CRATERS OF KAALIJÄRV, ESTONIA

In a note in this *Journal* (*Geogr. J.* 91 (1938) 490) Dr. L. J. Spencer briefly described his examination of eleven fragments from Crater No. 2, which Mr. Reinwald had sent for his opinion. They proved to be undoubtedly meteoric iron, with the characteristic crystalline structure, and Dr. Spencer agreed that the meteoritic origin of these craters is at last definitely proved: though in fact any one who had seen these craters under Mr. Reinwald's guidance, as did the writer of this note in 1933, could have had no doubt whatever that the main crater was caused by an intense superficial explosion that could be nothing but meteoritic (*Geogr. J.* 82 (1933) 375).

We have now received from Mr. Reinwald a reprint of his paper, No. 55 of the Publications of the Geological Institution of the University of Tartu, giving a detailed account of how he found the meteoric irons in 1937, and with several air photographs of the craters made by the Estonian Air Force. His great anxiety is that the site shall be preserved, and the excavations protected from the weather and from casual interference by visitors. The Estonian Government decided last year to take the Kaalijärv craters under the control of the State, but have not yet done anything to protect them. It is much to be hoped that action necessary to preserve so important a site will not be too long delayed.

VERNAY-CUTTING EXPEDITION TO NORTH BURMA

Although the scientific results of the recent expedition organized by Mr. A. S. Vernay and Mr. C. S. Cutting, trustees of the American Museum of Natural History, to north-east Burma may not be published for some time, a brief account of what was done will be useful at this stage. The party included, besides the two leaders mentioned, Dr. Harold Anthony, Curator of Mammals in the American Museum (mammalogist), Mr. J. K. Stanford, late of the Burma Civil Service (ornithologist), and Mr. F. Kingdon Ward (botanist). The expedition started from Myitkyina in November 1938 and proceeded *via* the 'Nmai Hka valley, Lauhkaung, and Htawgaw to Kangfang in the upper Ngawchang valley, where a base camp was established. Here collecting began in earnest. Trips were made to various places in the Chimili valley on the Salween–Irrawaddy divide, and to the western range, where a week's collecting was done in the high and cold Chawngmaw valley in January. One party completed the circuit of the Imaw Bum massif, establishing a camp at 10,000 feet; no attempt was made to climb the Imaw peak itself, which was under deep snow and promised no scientific results commensurate with the organization needed.

In February and March trips were made to the Hpimaw, Panwa, and Hpare passes into China, east of Htawgaw, and the party returned to Myitkyina in April. The collections amounted to approximately 1200 mammals, 1500 birds, and 2000 plants, with seeds of 50 or 60 species.

One of the most satisfactory results achieved was the clearing up of the mystery of an alleged black barking deer, reported from the Htawgaw hills. One or two specimens were obtained—and one other seen—proving conclusively that this animal is none other than the Chinese tufted muntjac, or Mickie's tufted deer, which was not previously known to occur in Burma. A magnificent series of the extremely rare water shrew, Nectogale, was obtained, also of other rare or little-known mammals such as the mole-tailed shrew (Anairosorex) and Neotetracus; new species or sub-species were also discovered. This is undoubtedly the finest collection of mammals ever made in North

Burma, nearly a hundred species being recorded, and, what is of much greater importance in modern scientific exploration, many good series being taken. A number of birds new to Burma, as well as several very rare species, were collected, including Temminck's tragopan, and Ward's trogon, this being only its third known locality.

The botanical results were equally satisfactory. Although several botanical reconnaissances have been undertaken in the Htawgaw hills, this is the first time systematic collecting has been done at this season, with the result that numerous species not known to occur here were found, notably *Cypripedium villosum*, whose type locality is so far away as Moulmein. An investigation was made of the Chinese coffin-plank industry, which was definitely associated with the rare monotypic conifer *Taiwania cryptomerioides*, and not with *Juniperus Coxii*, as had previously been suggested.

The mammal and bird collections are being worked out at the American Museum of Natural History, New York, the former under the personal direction of Dr. Harold Anthony. The botanical collection will be worked out at the New York Botanical Garden.

CHANGE OF THE NAME OF SIAM

From time immemorial the Siamese have called themselves ไทย Thai and their country เมืองไทย Muang Thai. The original meaning of Thai is in dispute, but Muang Thai is now generally understood to mean "the country (nation) of free people." Surrounding nations however knew it as Siam, Sam, Sem, Siem, etc., a name derived it seems from a Sanskrit root and supposed to mean "the brown people." The Portuguese Jesuits, who reached Burma and Annam before Siam, first heard of the country under its foreign name, by which they made it known in Europe. The foreign name was gradually forced on the Siamese themselves and appeared on the Siamese edition of two sheets of the International 1/M Map of the World published at Bangkok in 1917, not however as Muang Siam but as ประเทศสยาม Prades (*pr.* Prat*et*) Siam, "the Land of Siam." In the fourth edition of the 'Dictionnaire des Bureaux de Poste' (Berne, 1937) it appears as กรุงสยาม Krung Siam or "the Kingdom of Siam," and on recent postage stamps it has been simply สยาม Siam.

On 24 June 1939 the Office of the Council of Ministers at Bangkok issued a proclamation stating:

"Whereas the country is called by two names, viz., 'Thai' and 'Siam,' but the people are in favour of the name 'Thai,' the Government deem it expedient to establish the official name of the country to correspond with the name of the race and to meet the desire of the people as follows:

a. *In the Thai language.*

The name of the country, of the people and of the nationality shall be 'Thai.'

b. *In the English language.*

1. The name of the country shall be 'Thailand.'

2. The name of the people and of the nationality shall be 'Thai.'

But this change shall not affect any existing legal enactments in which the word 'Siam' is used."

The British Government is acquiescing in the wish of the Thai Government and henceforth the change will be adopted in all official correspondence. We

are informed by the Thai Legation that the suffix "land" is English, and that the full Thai name of the country is Prades Thai. "To use the word 'Thai' meaning the country is incorrect." The translation of the proclamation of 24 June 1939 is therefore evidently at fault in that respect. According to *La Géographie* 72 (1939) 48, Thaï-land is the name by which Siam is now to be known in France. It would seem then that the Thai Government has coined not an English name but a name for Western use by suffixing an English term to a Thai word. *La Géographie* deplores the unilateral decision of the Thai Government and states that the "Siamese" are not the only people who use the Thai language. There seems to be confusion here over the meaning of a difficult word. Admittedly *thai* has several applications, but the Thai Legation has been careful to state that the name Prades Thai means "Land of the Thai (people)." Nothing else seems to be claimed or even implied, and the change is the simple and reasonable one of rejecting a foreign name in favour of a long-established native name. The English name "Gulf of Siam" remains unaffected. M. A.

THE GROWTH OF CASABLANCA

The May number of the *Revue de Géographie Marocaine* is entirely devoted to a history and description of the port of Casablanca. In the first article, M. Jean Célérier analyses the geographical conditions of its development, insisting vigorously that if these conditions now appear favourable, they were revealed and brought into play only through the action of man, and that the decision by Marshal Lyautey, in the face of strong opposition, to build the national port of Morocco at Casablanca was a supreme act of faith. This portion of the western coast is exposed to the full force of the Atlantic, and has no natural shelters of any considerable size. When however the work of constructing a port accessible at all times was begun at Casablanca, it was found that the local geological conditions were favourable to building a sufficiently large jetty, and in time other local factors were seen also to be advantageous. From the first the port was designed as a national port, and by fulfilling these requirements it has attracted activities of lesser importance to its neighbourhood; for example it is now the centre of a considerable trade in early fruit and vegetables, and is also a growing fishing port. Undoubtedly however its economic value is built upon the development of the Moroccan phosphate deposits, unforeseen at the time it was planned. The position is well summed up in the words of Lyautey: "Luck, perhaps, but there it is: the phosphates were discovered. And are you certain that the phosphates would have been discovered if I had not built Casa? And if there had been no phosphates, something else would have been found."

Subsequent papers emphasize the central position of Casablanca with relation to the main routes of western Morocco, which enables the port to select its traffic, leaving the heavier and less valuable to the smaller regional ports; its favourable position as a port of call and transit on world routes; and its strategic importance in the structure of the French colonial empire. These factors have made Casablanca in twenty-five years the largest European and native city in Morocco.

BARTHOLOMEU DIAS' FARTHEST PILLAR

What seems to be a conclusive identification of the site of the farthest *padrão* (a pillar surmounted by a cross) erected by Dias on the southernmost coast of Africa during his famous voyage past the Cape of Good Hope has been made by Mr. Eric Axelsen as the result of careful study of the old records and

investigations in the field (*S. African Journ. Science*, vol. 35, December 1938). The question has been much discussed and various answers suggested, so such a final solution, fortified by the discovery of what seem to be the actual remains of the pillar, is to be welcomed. The site has been placed (1) on Cross Island in Algoa Bay or the mainland near-by; (2) on Cape Padrone farther east—the position favoured by Dr. Ravenstein in his article in the *Journal* for December 1900; (3) at the mouth of the Kowie, still more to the east. Mr. Axelsen's study of the sources, particularly João de Lisboa, led him to place it on some point of land taken by mistake for an island 5 leagues east of the Bird Islands (in which opinion he allows he had been anticipated, in 1935, by a Portuguese writer, Captain Fontoura da Costa, but his own researches were carried out in ignorance of this). In the position adopted he found on the chart a headland significantly named False Island, and here he undertook a thorough search for traces of the pillar, concentrating on the most prominent point, known as the Third Kwai Hoek. Here the surface layer of sand was systematically probed by steel rods driven in at close intervals, and a search also made among the rocks at the foot of the cliff. In both positions many fragments of limestone not agreeing with any known in South Africa, but which might well have come from Portugal, were found. The larger pieces showed signs of artificial shaping, they agreed in size with other known remains of *padrões*, and some when fitted together displayed lines of lettering (now illegible) similar to that of contemporary inscriptions on such monuments. In the list of authorities cited the reference to Dr. Ravenstein's article is slightly incorrect: p. 6 should read p. 646. Although the site established differs from Ravenstein's, the distance apart of the two is not great. E. H.

THE NORWEGIAN SECTOR OF THE ANTARCTIC

In the note on the "Course of Antarctic exploration between long. 20° W. and 110° E." published in the *Journal* for September, a reference was made to the Norwegian claim to the sector between Coats Land and long. 45° E. The current number of the *Polar Record* contains a translation of the Royal Decree of 14 January 1939 proclaiming Norwegian sovereignty over this area, and of the Recommendation from the Ministry of Foreign Affairs upon which the Decree was based. We are instructed by the Foreign Office that on September 1 the Norwegian Minister in London was informed that His Majesty's Governments in the United Kingdom, the Commonwealth of Australia, and New Zealand recognized Norwegian sovereignty over the territory in question.

The Decree reads:

We HAAKON, King of Norway, do hereby proclaim:

That part of the mainland coast in the Antarctic extending from the limits of the Falkland Islands Dependencies in the West (the boundary of Coats Land) to the limits of the Australian Antarctic Dependency in the East (45° E. Long.), with the land lying within this coast and the environing sea, shall be brought under Norwegian sovereignty.

Given at Oslo Palace on the 14th day of January 1939.

Under Our Hand and the Seal of the Realm.

HAAKON

(L.S.)

Johan Nygaardsvold B. Rolsted

The eastern boundary quoted is the meridian laid down as the western limit of the Australian Antarctic Territory in the Order in Council of 7 February 1933

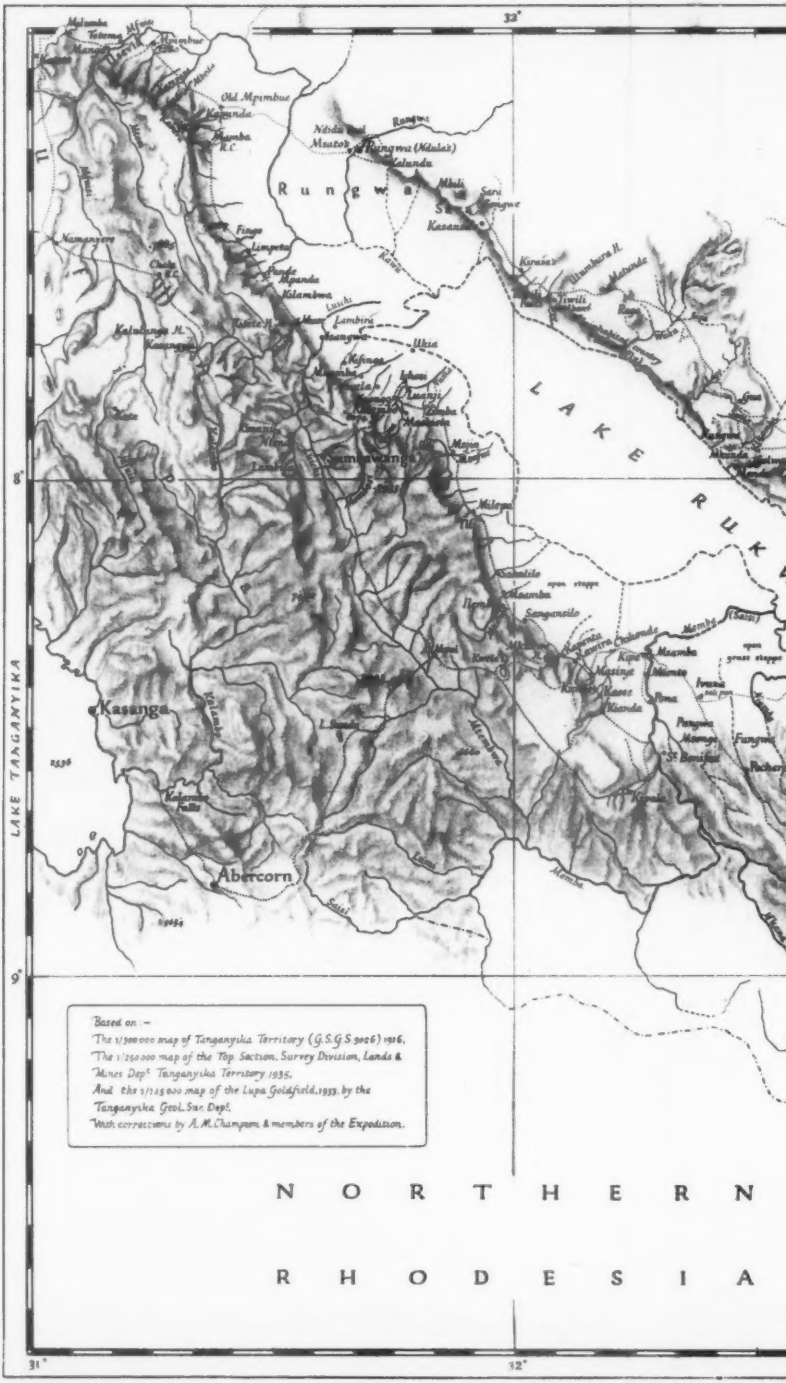
(*London Gazette*, 14 February 1933). It will be noted that no meridian is given as the western boundary of the sector, which is stated to be the boundary of Coats Land. Coats Land was first sighted by W. S. Bruce on the *Scotia* expedition. The ice barrier was seen on 3 March 1904 in 72° 18′ S., 17° 59′ W. and traced for about 150 miles to the south-west. Subsequently Sir Ernest Shackleton sighted it on 10 January 1915 in 72° 34′ S., 16° 40′ W., and sailed along it to the south-west for eight days. The eastern limit of the Falkland Islands Dependencies was declared by Letters Patent of 28 March 1917 to be the meridian of 20° W., and we are informed that His Majesty's Government have recently accepted this meridian as the western boundary of the Norwegian sector.

The Royal Decree makes no mention of the northern limit of the sector beyond a reference to the "environing sea." The Recommendation from the Ministry of Foreign Affairs discusses this aspect, but does not suggest a definite limit. "It has been maintained that the ice-limit in the Antarctic must be regarded as the limit of the continent, and Great Britain and the two British Dominions that have taken land here have in the main drawn the limit along the 60th degree of latitude. What this implies in respect of the right to sovereignty does not appear to be quite clear. . . . For the very reason that such questions of territorial limits remain undecided, it is most desirable for the Norwegian whaling industry in those seas that Norway should hold dominion over a wide tract of the mainland with adjacent waters." On the Norwegian sketch-map accompanying the article in the *Polar Record*, the northern limit is shown as the parallel of lat. 50° S. This brings Bouvet Island, over which Norwegian sovereignty was proclaimed on 1 May 1931, within the limits of the sector.

The Recommendation gives a brief summary of Norwegian work in this sector, mainly undertaken by or for Mr. Lars Christensen, and of which a more detailed account was given in the *Journal* for September. Apart from a landing on shelf-ice by Riiser-Larsen on 5 March 1933, no one appears to have set foot on this sector.

ELECTIONS

At a Special Meeting of the Council on 27 September 1939 the following were elected Fellows: John Abel, F.Z.S.; Major R. Harrison Archbald; S. K. Bhivandkar; T. N. Leslie Brown, B.A.; A. E. R. Bruce, B.A., A.C.P., M.R.S.T.; Miss M. B. Byles; C. Whitney Carpenter; Mrs. C. Whitney Carpenter; C. Denley Clark, F.R.C.S.; Captain S. J. Cuthbert; A. T. Dalton; S. G. Davis; Marquis Julio De Amodio, M.A.; Edward Delson; P. W. C. Dennis; Miss Inez K. D'Silva, B.A.; George Dury, B.A.; T. E. N. Fargher, PH.D.; Mrs. I. S. Farrow; Lieut.-Colonel R. V. M. Garry, M.C.; Lieut.-Colonel T. Gregory, M.C.; Marquis de Visdelou-Guimbeau; E. Healey; A. A. Johnston; Shah Ali Khan; B. C. Law, M.A., B.L., PH.D.; G. de Preston Leeper; Rev. H. C. C. McCullough; Miss J. J. M. Macintosh; J. K. Mitra, B.SC.; E. D'Eresby Moss; A. Mowbray; J. H. Mowll; N. L. Nevison; J. W. Pallister, B.SC.; Miss M. H. Parker; L. C. Salamon; W. E. Sansom; R. N. Sinha, B.A.; T. J. H. Speedy; M. Henri Storck; H. F. Swann, B.A., B.PAED.; R. C. Wakefield; B. Carington-Walters; Mrs. S. Wharton.



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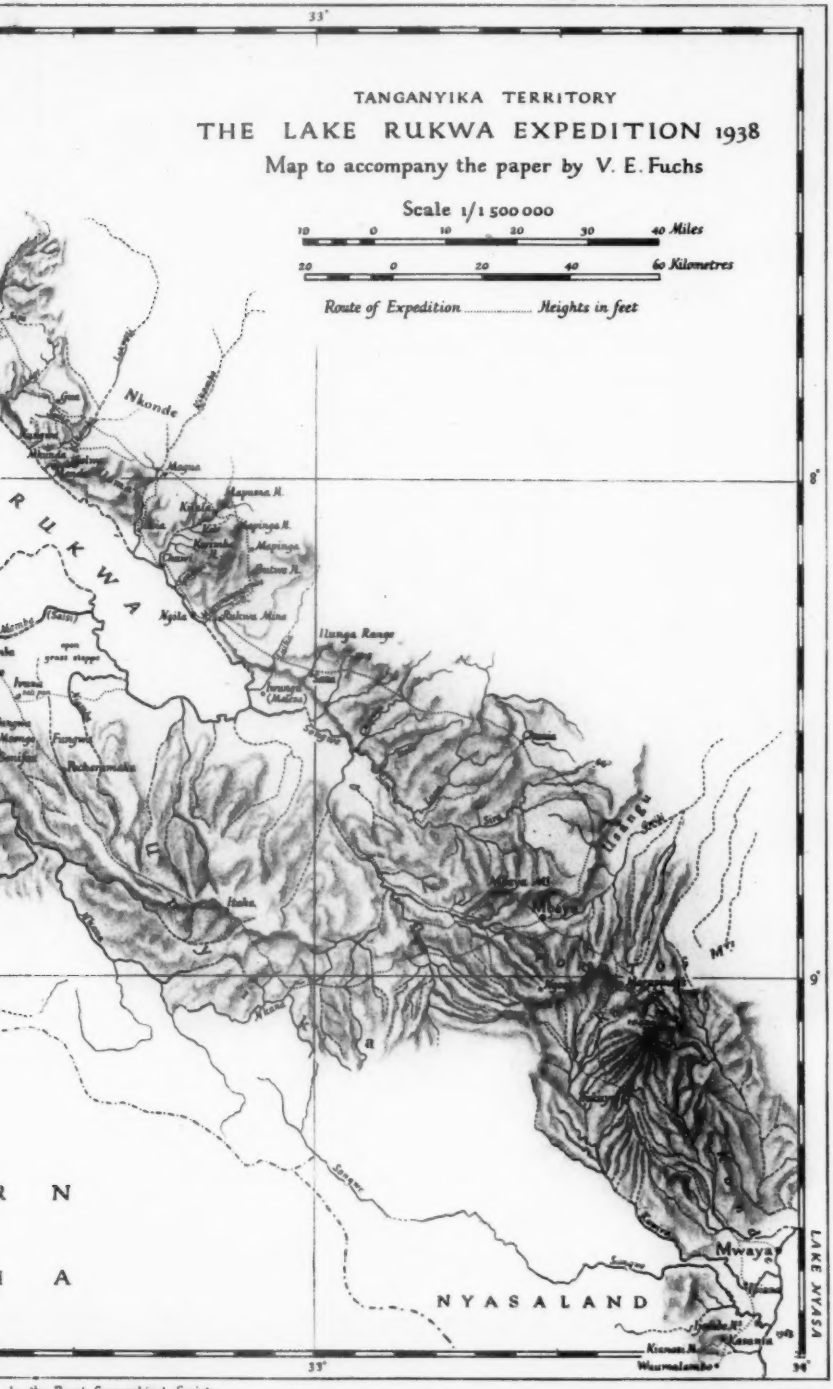

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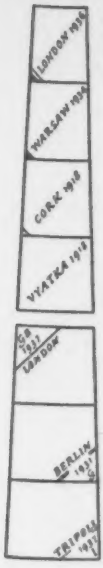

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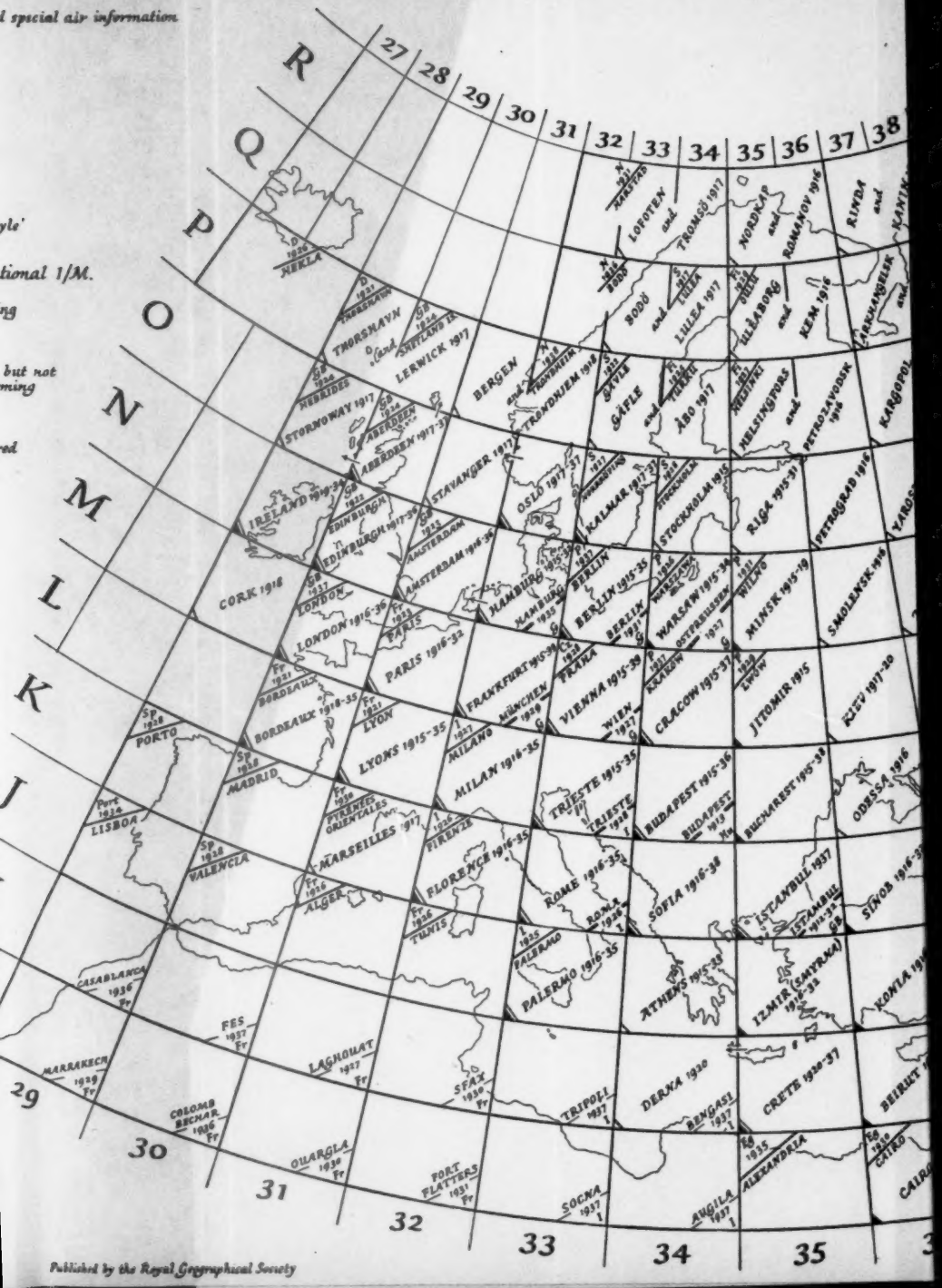

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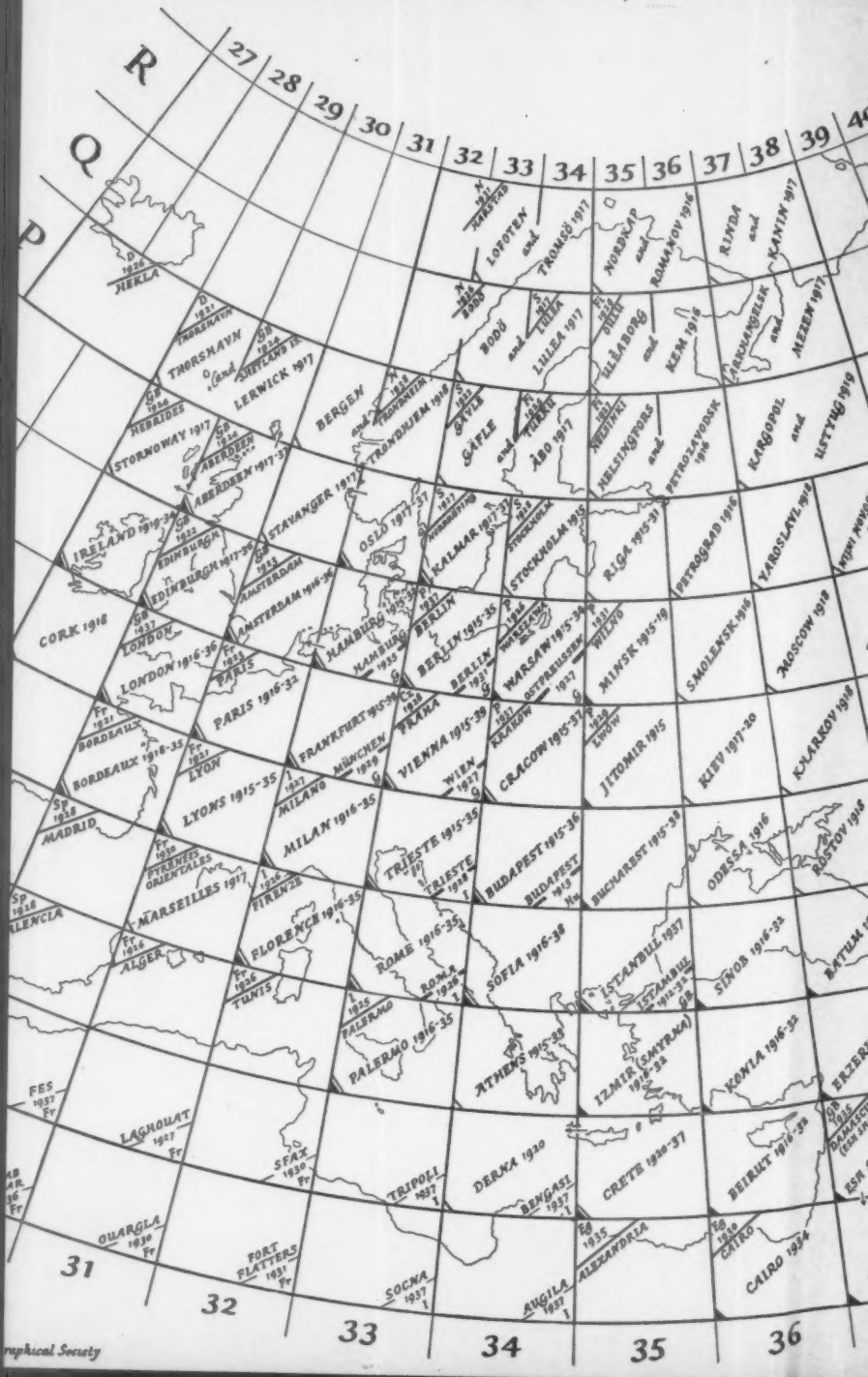
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